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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

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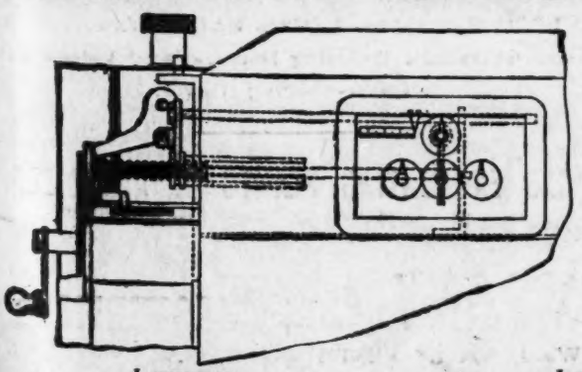
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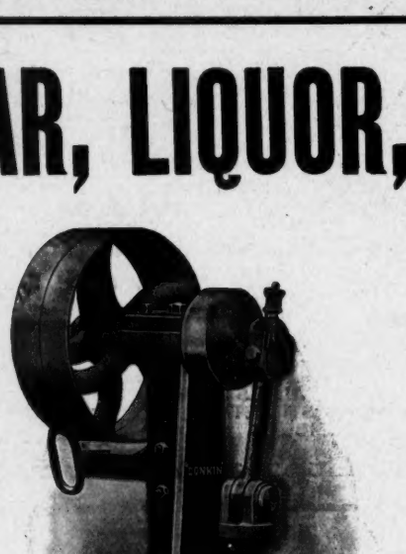

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CXXXVIII., No. 2820.] TUESDAY, MAY 29, 1917. [69TH YEAR.

EDITORIAL NOTES.

The Proposed Headquarters—A Threatened Cleavage.

THE times have changed; and everything (with probably the gas industry as an exception) is going to be considered and dealt with on a broader basis than heretofore. This applies to Governmental matters as to other things. Autocracy has had its death-blow; and democracy is to-day in the ascendant. We are bidden, too, to think imperially, to eschew dictatorial action, and to examine questions from the "other fellow's" point of view before coming to a positive decision. On Monday last there was a meeting of the composite Building Committee who have in hand the question of the preliminaries of what it was generally hoped was intended to be central headquarters for the industry. The meeting was held in private; and no official digest of the proceedings, or information [see note at the end of this article] as to the position as the result of these proceedings, has been allowed to transpire. This is a pity, for more reasons than one—the main one being that it illustrates again the harm that comes from secrecy over a matter of a purely domestic nature, and in connection with which, in this instance, it was pardonable to think that publicity at every step, and as early as possible, would be of advantage in assisting to create enthusiasm. In place of official report, we have rumour. Rumour is sometimes accounted a "lying jade;" but on this occasion rumour is consistent in suggesting that already a rock has been formed upon which there is danger of the scheme for central headquarters for the gas industry, upon which so many had set their minds, coming to grief.

A fortnight ago in drawing attention to the circular sent out by the Council of the Institution, we wrote as follows:

> There is one suggestion we should like to make to the Institution Council. It is that in handling this important matter—all praise to them for taking it up—they will do much better to encourage the idea that it is a central home for the "industry," and that there are going to be no "top dogs" in connection with it. In one place, it speaks of a central home for the "industry," but another paragraph reads: "There can be no doubt that, when "the *Institution* enters into possession of a building *of its own*, "it will enable the work of the gas industry to be more vigor- "ously advanced than has been possible hitherto." We suggest that the word "Institution" should be "industry," and that when, in time, the home is established, the property should be vested in trustees for the industry. The major part of the money required for the building will not be provided personally by the members of the Institution, but by the industry generally. The funds will be obtained much quicker if the notion of headquarters for the industry is kept in the ascendant.

In writing the paragraph, it was felt that we were touching, and touching betimes and advisedly, on the point of danger to the scheme. And this proves to be so. Rumour says—and rumour comes from several quarters—that there are those who are proposing contributions with conditions attached which would take away part proprietorship and equality of privileges and rights of the various elements constituting the entire industry, and would therefore eliminate from the scheme all idea of central headquarters for the industry. On the other hand, there are influential representatives of other sections of the industry who cannot recommend contribution, and who will not contribute, to the funds unless the scheme is a joint one not only in contribution, but in all else. We do not blame them. Their view is the larger view which we take of the scheme and its ultimate comprehensive utility in the service of the industry. If those who propose the limitation of control and use of the headquarters are making the contributions out of their own individual pockets, then no one can openly complain, though every one can think as he likes of the action. If, on the other hand, the contributions are proposed to be taken out of the funds of gas undertakings, then there is all the more reason for the scheme having for its aim headquarters for the entire industry. The funds of gas concerns represent much more than the engineering element in the industry.

It is regrettable that in nearly every scheme which is proposed for the benefit of the industry, and which contemplates the bonding together of the whole of its forces, with the view of strengthening it and making it more powerful in driving force and in resistance, obstacles should arise from a few quarters. There is now in existence a *National* Gas Council. Are we in consequence of this embodiment of unity and oneness really dealing with the affairs of the industry from a national and unified point of view? Are all questions of general import being dealt with by representation and expression of the views of the majority, or are some matters being controlled by a minority, though the minority be influential? This question of headquarters for the industry is distinctly one for the National Gas Council, as a body, and as the top-stone in our industrial organization. Times have changed; and we do not see why headquarters should be provided, at the expense of the whole industry, for one section of its organization and not for all the other sections. We may say at once that this headquarters scheme will not go forward to the success many have desired unless it is stripped of exclusiveness within the full legitimate limits of the industry, and unless it is dealt with broadly. If it is to be a scheme of headquarters without proprietorship and rights and privileges covering the whole industry, then let those who prefer such limitation provide the necessary funds for their narrow conception of what is desirable.

We have written plainly because resentment already exists, and unfortunately is growing before even the preliminaries are well under way. Now is the time to put the matter right if the rumours flying around are mistakes. Plain writing gives an opportunity to those who have the power to take the steps needful to stop a cleavage in the good that hard work and perseverance has already effected in consolidating the forces and interests of the industry, in which work we have tried to do a not unworthy part.

[Since this article was written and put in type, the annual report of the Council of the Institution of Gas Engineers has been received, and, from a reference in it to the meeting held yesterday week, there is no room for doubt that the proposal for headquarters for the whole industry has been knocked on the head. Under the first resolution, the scheme has been reduced to the provision of "a suitable building "for use as a central home for the Institution of Gas "Engineers." Under the second resolution, it was decided to form a Building Committee, "consisting of those whose "names are contained in the list which was issued with the "Institution's letter of May 11, 1917, with power to add to "their number." There are certain of those whose names appear in that list who will be unable to support the limited scheme.]

The Institution Report.

NEXT week will be a busy one for the members of the gas fraternity. On Monday afternoon, there will be the first general meeting of the National Gas Council, when it may be expected that the President (Mr. H. E. Jones) will occupy the chair. On Tuesday, the Institution of Gas Engineers meet under the presidency of Mr. A. E. Broadberry, who, the succeeding day, will be receiving the members at the works of the Tottenham Light, Heat, and Power Company, where there is for inspection some highly inter-

esting constructional work, comprising a complete new manufacturing section, with Woodall-Duckham continuous vertical retorts. In anticipation of the meeting, the Council have issued their annual report; and, despite the current shortage of paper, they have managed to find for it material running out to some 68 pages, including an index. The document, on this occasion, might have been somewhat shortened by reference. For instance, the specification on street lighting could well have been omitted, seeing that it was published in full in the "Journal" no less than four years ago as an appendix to the paper then read by Mr. A. P. Trotter before the Illuminating Engineering Society. The same thing applies to the memorandum by Mr. T. Y. Greener, the Chairman of the Carbonization Sub Committee of the British Association Fuel Economy Committee. This was printed in our columns in September last year. However, completeness of record in the "Transactions" is no doubt the reason for the extraordinary bulk.

We will not attempt to review the whole of the detail in the report, which discloses the many matters that have engaged the attention of the Council, and upon some of which there are good grounds for complimenting them—not by any means the least being their success in securing the Right Hon. Lord Moulton as President for the coming Institution year. They have also been occupied with some highly useful work in connection with the industry's men who have passed into military service, and with further enlistment. Welcome is especially given to the Demobilization Committee appointed for the purpose of assisting members of the gas industry of all grades who have joined His Majesty's forces to return to their respective positions at the end of the war. These men must not be allowed to be cut adrift or to suffer because of their loyalty to, and work for, the country. With Mr. R. G. Shadbolt as Chairman of the Committee, this good work will be kept well in hand. A worthy extension of the honorary membership list is being made—the names being of men whom it will delight the whole British gas profession to honour. We are glad to see the swelling number of certified gas-fitters—the greater the number, the better for the industry. A good deal of space is quite properly given up in the report to subjects associated with research; but an opportunity will be afforded after the annual meeting of saying more in regard to the actual position of the work of the Committees. The Council have done well in endorsing a proposal, and providing the funds, for research which will supply "A Comparison of Different Grades of Gas within the Limits regarded as at all Practicable in the Gas Industry as to their "Efficiency in Use." The Gas Lighting, Heating, and Ventilation Research Committee (of which Prof. Smithells is Chairman, and of which Prof. J. W. Cobb, occupant of the Livesey Chair at the Leeds University, is a member) are taking up this matter, which is one of pressing importance, and should be pushed forward, if it is to be of the largest service to the industry, with such rapidity as the present curtailed resources of the Fuel Department of the Leeds University will allow. An outstanding and timely piece of work during the year was the issue of the brochure on "Naphthalene Stoppages," for the drafting of which there is indebtedness to Dr. H. G. Colman and Mr. W. E. Price, the Hon. Secretary of the Institution. Many other subjects are reported upon, which show the busy time the members of the Council have been having, notwithstanding the claims upon them of their undertakings during the war.

Among the appendices will be found the revised "Standard Conditions of Contract," which the Council and the Society of British Gas Industries have approved; as well as the report by Mr. D. H. Helps, the Institution representative on the British Association Fuel Economy Committee, whose work has lately been taken over by the Board of Fuel Research. We sympathize with Mr. Helps in the difficulties he found obstructing him in producing a reply to the first question in the reference, as to the number of vertical and horizontal retorts in operation respectively, and the comparative merits of each, but congratulate him upon the interesting points introduced into his report upon the uses of coke (though unable to say how much gas is used for industrial purposes), and upon his sketch of the lines along which progress is taking place in the industry. It was not a one-man job that was entrusted to him; but, like a good workman, he has made the best he could of it. To obtain the statistics asked for would have meant circularizing the entire gas industry, and then the result would have only been an unreliable estimate. The report was, we believe, sent to the Council a year ago. Had it been drafted later, Mr. Helps might have been rather more emphatic on the point as to the inadvisability of fixing a uniform calorific standard; and he might also have modified the statement that "it is reasonable to suppose that the suppliers of gas "will not be so unwise as to distribute a commodity which "is not the best suited to the requirements of their customers." This statement, there has been disclosure, has not universal application.

Looking Forward—A Word with our Plant Manufacturers.

If not explained, some of the items that have lately appeared in gas companies' accounts would be highly delusive to the shareholders; and none more so than those which record the amount charged for repairs and maintenance of the works and of the distributory plant and appliances. The shareholders see that approximately the same amount of money—perhaps rather more—has been spent in these directions as in the peaceful pre-war days, which now seem so far away. They console themselves with the thought that—though the gas industry is passing through hard times on account of manufacturing costs and trading restrictions—the fabric of their undertaking is still being maintained in good and sound condition, and so the works will be ready to enter with unaffected integrity, with only normal expenditure upon them, when the interrupted course of the world's ordinary ways comes to an end. The lay mind does not, unless it thinks deeply, appreciate that (as Mr. H. E. Jones recently put it at the meeting of the Bombay Gas Company) the purchasing power of money in these directions, as in all others, is so much less to-day than it was before the war; and therefore, though these items disclose an equal or perhaps a larger expenditure, they represent a much smaller amount of work. Actually, boards of directors and committees of municipal gas undertakings are not spending more than they can help while materials and labour are at their present high prices. But there are many who would spend more on upkeep, if only the necessary materials and labour could be procured. There will therefore be a large amount of leeway to be made up after the war, and this will then mean a heavier outlay. Extensions and new works schemes have also been held-up, partly through the same causes of dearness and scarcity of materials—a scarcity due to war demands for metal—and labour, and partly to the restrictions placed by the Government upon the issue of capital and the raising of loans unless it can be shown that the work is essential in connection with the war.

The manufacturers and contractors for the erection of plant are dominated by in degree the same influences, and more so, because a large part of their establishments and resources are being devoted to the production of munitions. Yet they, too, have had their staffs depleted; and not only are the controlled prices of pig iron, steel, copper, brass, tinplates, and manufactured metals considerably greater than the costs ruling before the war, but their use is restricted. Even if the gas undertakings had the power to spend, and it was wise to do so in the existing financial and market circumstances, the manufacturers of plant could not do more than they are doing, and this on work which is imperatively necessary. There is no question that, as soon as release from the present ties is given, there will be a keen scramble for the execution of arrears of work and new work. A busy time is in store for our manufacturers. They will all be wanted; and all their resources will be drawn upon to their maximum. The tension will be great for them. But a point of importance is that they must get and keep in touch with gas undertakings to see what is likely to be required of them; and particularly must they keep *au courant* with the movements which are taking place in the gas supply industry, and which may make a large difference to the character of the plant which will soon and quickly be in demand.

What is the probability as to the character of this plant? If there is going to be a big boom in gas supply—if the gas industry is going to take its rightful place in the revival of trade and in the big trade "push"—there will have to be not a few extensions of plant. There are some manufacturers who are already getting in the thin end of the wedge through inquiries where it is known that contracts will possibly be going. But before anything definite is done, care should be exercised as to the likely issue of the movements which are gathering momentum and force in the industry in the direction of distributing a good combustible gas—a gas which

will give the consumer a high flame temperature at as low a price as is attainable. A new world confronts the gas industry; and producing and demand conditions are not going to simply revert to the *status quo ante bellum*. Those that will exist—not the least being that competition with the gas industry promises to be keener after the war than before—will require every effort being put forward to realize more economical gas production. Our competitors appreciate that the war has pointed the way to opportunities for the gas industry, and has established it firmly in extended service. But the industry must not falter at the very threshold of these opportunities—and, through faltering, fail! Let us very briefly examine the conditions, well known though they be. The industry has to reckon that coal and oil will for many years to come be dearer than before the war. It has to consider, too, the claims on it to assist to the utmost of its ability in the conservation of coal, yet with the prospect of a largely extended demand for gas, given a reasonably low price. It has to take into account, too, that money will be dearer in future, and that this condition will be intensified by manufacturing plant and other goods being more expensive than prior to the war, which means that the same conditions that will bear hardly upon gas undertakings will also bear hardly upon the makers and contractors for plant and appliances. It must calculate, too, upon a large number of skilled gas men having finally passed from the scene of their former labours, or else being incapacitated from further participation in them. It must reckon, too, that there will be very active competition for able-bodied men in the indutries for the coming effort to secure a larger share of the overseas trade for this country and, indeed, for the whole Empire. It must also be accepted that wages are not going back to the ante-war level.

These, briefly, are the prospective circumstances on which comes the insistent demand of the conditions which are growing round about us, without any great effort on the part of the industry—conditions industrial and household—for cheaper gas, if lower in calorific power no great matter so long as it is combustible gas which will give a good flame temperature without the inert gases which have in some undertakings in recent years come all too freely into action to detract from the efficiency in use of the supply. The prospective conditions and the demand oppose each other. The former are irresistible; and we must not look to them for any large immediate assistance in attempting to comply with the demand, though there will, of course, be a lowering of their war-levels. The technical men of the industry have been put upon their mettle during the war; and they will be put upon their mettle with equal intensity after the war, if we judge the signs correctly, to meet the competition for business and to carry the industry into its proper place in the country's work and service. It is patent that it is through its processes that economy and cheapness must come; and it is upon this course of the current of movement that the plant manufacturers must keep an eye, and prepare accordingly. As was said last week in our first editorial, it is just possible that the temperatures of coal carbonization will be somewhat reduced, and consequently a lower quantity but richer gas, free from all avoidable inert constituents, will be produced per ton of coal carbonized. This will not affect the yield of those commodities which the country requires, and which will necessitate the continuance of oil-washing. It will reduce, too, the wear and tear upon the retort plant. The make per ton of coal will be supplemented by a percentage of water gas which will dilute the coal gas without adulterating it—in fact, will probably diminish the inert constituents in the bulk. This appears to be the likely line of gas development to achieve economy, while giving the consumers a useful heating gas. It will lessen the quantity of expensive coal and (where used) oil required per unit of gas production. It will influence, too, the character of the coke and the production of residuals generally, and help to improve the markets for them. Every means must be taken to reinforce the position of the industry. Through any economy that can be achieved (by manufacturing processes and residuals) upon the conditions that may at the time be current, the industry may hope to enlarge its business. Enlargement of business will mean the provision of more plant and appliances of all kinds, and more to be kept in repair. Though, by the aid of blue water gas or lightly carburetted water gas, less coal-carbonizing plant would be required per unit of production, this, it may be hoped, would be compensated by the growth of business. Upon this, the manufacturers of plant have to keep their eyes, as well as upon the movements in connection with oil-washing plant, distillation plant, tar-dehydration plant, the need for good capacity in condensing plant, and all that extended business claims. The makers of gas-using appliances of every description should study the prospects in connection with their goods, and should not now send out a single piece of apparatus without an air-regulating device upon it, as well as be prepared to supply such regulating means for all existing appliances.

Gas production is now undergoing fresh investigation and experiment; and experience is being gathered through the impelling force of present circumstances. Fresh ideals have been and are being formed by gas men. Parliament will be approached with all the arguments that have been thrust upon the gas industry by the war, by the new circumstances, and by the wisdom which the opening of the eyes of the nation has aroused, and which says that the country must throw off the shackles of its old ways, and adopt new. The Ministry of Munitions, the Coal Controller's Department, British Dyes Limited, the motor fuel industry, German ambitions in industrial and trade domination, and, last but not least, the power of submarines, have one and all put into the possession of the gas industry arguments to which there is no reply, and which can be used in the cause of greater liberty—liberty dictated by science and by national service, and not restricted by the predilections or whims of politicians, nor by the influences fashioned by obscurantism or by the selfish interests of opposing industries. By all men concerned in the progress of the gas industry, these matters should be noted, and have assigned to them their true value. They are impellents in that progress, and to reject them, or not to make full use of them, will be disastrous. Opportunities must not be lost; and best use will be made of the opportunities by those who work up to the precept, "Look Forward, and Be Prepared." The results of the neglect of the precept are illustrated by the war in painful manner.

The Limitations of an Inquiry.

On various occasions recently, there has been mention in these columns of the Committee appointed by the Board of Trade to consider the question of what steps should be taken to ensure an adequate and economical supply of electric power for all classes of consumers in the United Kingdom, particularly industries which depend upon a cheap supply of power for their development. The electricity supply industry harbours a number of individuals whom it is very difficult to please. They are dissatisfied with most things concerning their own immediate industrial affairs, including the doting interest of the Board of Trade, now that Sir Albert Stanley is there as President, with his full knowledge of the administration of electric traction companies to guide him. The Committee that he appointed ought before this to have been completely pulverized by the criticism that its composition has received. But it has not been; and it is very much intact. In fact, before hearing any evidence, it has arrived at a set of remarkable conclusions. They are remarkable for the reason that they happen to be precisely those at which most men in the electricity supply industry arrived years ago. Therefore, just as the criticism of the composition of the Committee has not in the least perturbed the Board of Trade or its latest offspring, so the preliminary conclusions of the latter are not likely to create even a ruffle on the surface of electrical affairs.

It is suggested by the first conclusion that the success of British industry after the war will depend upon the adoption of the most efficient methods and machinery, so as to reduce manufacturing costs as much as possible. This is a profound finding; but it and the next conclusion—that a highly important element in reducing costs will be the general extension of the use of electric power supplied at the lowest possible price—suggest that the reference to the Committee is far too narrow, and that the composition of the Committee, being practically all electrical, is not the best to consider the whole question of the provision and supply of power to industry—not only electrical power, but that derived from other agents, about the value of which as prime movers the electricity industry can speak from experience. The power company element on the Committee shows its claws in the framing of the third conclusion—that the supply of electricity in a large number of small areas by separate authorities is incompatible with a tech-

nically sound system. It is a great pity that this was not thought of years ago. It is a long road by which the electricity industry has travelled to its present position; but nothing whatever was done to afford the small areas in question a supply of electrical energy until the smaller undertakings were established. The uneconomy of the proceeding has been a considerable time worming its way into the electrical intellect; but it has got there now. Then the Committee finds that the interconnection of existing supply stations, as recommended by the Board of Trade in May last year, cannot alone meet the requirements of the situation. Nobody thought it could. But it will be observed that the Committee does not suggest that, where interconnection is feasible, it would not contribute to economical working, and so might be adopted as a useful initial thoroughfare to the ultimate attainable economy. Lastly, the Committee arrives at a conclusion to which its own appointment suggests the Board of Trade had previously come: "That a comprehensive system for the generation of "electricity and where necessary reorganizing its supply, "should be established as soon as possible."

The conclusions we suppose must be taken merely to represent a sort of jumping-off board; for the Committee also now announces that it intends doing precisely what everybody expected that it would do—invite representative associations throughout the country to submit evidence as to the best methods of giving effect to the conclusions. The Committee has not got far into its work; but this preliminary effort does not disclose any extraordinary collective inventive power. Perhaps in due season there will be surprising revelations of this power; but there still exist doubts as to this in the electrical industry. There will be an interested watchfulness over the work of the Committee on the part of the gas industry, which is also a supplier of power, and hopes, notwithstanding the Board of Trade Committee, to make itself still more valuable in this particular field.

Coal Gas for Motor Buses.

With further limitations of the distributed quantities of petrol, we may soon be seeing motor buses traversing the streets of London and many other centres under the propelling influence of coal gas. They are already running, as our news columns have shown, in various places in the Provinces; and the other day an advertisement was seen announcing that "motor coaches (gas power)" left London for Eastbourne on certain days of the week, and returned on certain other days. The special mention of "gas power" looks as though it is put in as a recommendation for those conscientious objectors who would not at the present time undertake a "joy ride" if petrol was expended for the purpose, while it is so badly needed for commercial vehicles. Necessity is the mother of invention; and the necessity for finding a substitute for dear petrol has induced trials (which have been highly encouraging) to be made with the driving of petrol engines with coal gas, which is an application that would perhaps have been very frequently adopted long since had it not been for the difficulty of providing adequate storage for a good run, without adding greatly to the weight of the bus or other vehicle. This is practically the only difficulty; and we are hoping to hear what the promised report of the British Commercial Gas Association and the Institution of Gas Engineers will say about this aspect of the subject. The hideous flexible gas containers adopted as an expedient in the present emergency will not be tolerated longer than necessary; and cylinders and compressed gas are the only alternative, which means weight, and fairly frequent recharging. This is the point that has to be investigated and, if possible, overcome.

Running Fuel Cost and Efficiency.

For the rest, coal gas has proved cheapness, and good running power. The position in respect of these matters can be gathered from the paper that Mr. W. Clark Jackson read before the recent meeting of the Welsh Association, and which is published to-day. In respect of efficiency, coal gas in practice does better than on its calculated theoretical basis it ought to do. In respect of thermal value, the relation of 500 B.Th.U. coal gas to a gallon of ordinary commercial petrol would be 273 c.ft.; and on the basis of 84 p.ct. engine efficiency using coal gas, the comparative figure is 325 c.ft. of gas. In other words, 1000 c.ft. would be approximately equal to 3 gallons of petrol. As a matter of fact, the actual consumption of gas is lower in practice, although, of course, the figures would vary with different weights of buses, engine efficiency, and road characteristics. From figures recently published from Harrogate, it was shown that buses there had run 12 miles on 500 c.ft. of gas, and on good roads 14 miles. Under similar conditions, the bus has done 6 to 7 miles on a gallon of petrol; so the equivalent per gallon of petrol in this instance is 250 c.ft. of gas. Mr. Jackson himself describes a case where with a car load as high as 9 tons (the buses weighing 3½ tons), the gas consumption was 350 c.ft. per 12 mile run, and in another case an average car load of 7 tons has been run 18 miles with a consumption of only 370 c.ft. These figures from actual running are considerably lower than the previously mentioned calculated equivalent to a gallon of petrol; and with engines specially constructed for coal gas, a still higher running efficiency should be realized.

Stimulating the Use of Sulphate of Ammonia.

In a communication to the Board of Agriculture, Mr. A. W. Oldershaw, B.Sc., Agricultural Organizer for East Suffolk and Hon. Secretary of the East Suffolk War Agricultural Committee, tells the steps taken to stimulate the use of sulphate of ammonia. Inquiries elicited the fact that considerable supplies of sulphate were available in manufacturing centres in the North and Midlands; but, being at a considerable distance from East Suffolk, the local merchants were not prepared to buy and store any considerable quantity of it on the chance of its being purchased by East Suffolk farmers. The Committee decided that the best course to pursue would be for them to purchase a preliminary 200 tons from local firms, and re-sell it to the farmers. This course was adopted with the approval of the Board of Agriculture. All members of the District War Agricultural Committees were asked to canvass the parishes which they represented, and to obtain orders for sulphate of ammonia. On an average, each member represents two parishes; so that the work placed on any individual member did not prove very onerous. At the commencement of February, when the canvass was undertaken, most of the farmers who are in the habit of using chemical manures had already made their purchases; the Committee having appealed to farmers, by means of posters and a circular-letter sent out to every farmer in the county in November, 1916, to use an increased quantity of chemical fertilizers and to purchase early. As a result of the personal canvass, orders were obtained for no less than 694 tons 16 cwt. of sulphate. The success of the scheme must be attributed in great part to the enthusiasm with which the members of the District Committees canvassed their neighbours. With each invoice a short leaflet written by the County Agricultural Organizer was enclosed, giving detailed instructions, in as clear a manner as possible, as to the use of the manure and the crops to which it should be applied. It may be estimated that with ordinary good fortune, and if used judiciously, 1 cwt. of sulphate of ammonia is likely to produce 2½ cwt. of grain. On this basis, the increased quantity of grain obtained in the county as a result of the action taken by the Committee may be placed, roughly, at 1700 tons.

Municipal Gas-Works Results.

The reports of the working during the past financial year of various gas undertakings owned by local authorities which are noticed in this issue of the "Journal," bear clear evidence of the prevalence of war-time conditions during the period over which the operations have extended. Sales of gas at Brighouse have fallen off to the extent of something under 3 p.ct.; and this decrease is accounted for principally by the reduced consumption of the public lamps. It is to be noted that the prepayment meters, which accounted for 26·27 p.ct. of the total gas sold, record an average consumption of 12,190 c.ft. There is reported from Colne a decrease of something less than 3 p.ct. in the quantity of gas sent out; but as there was a large reduction in the amount consumed for street lighting, the net decrease by all other consumers comes out at only 0·1 p.ct. The net profit, at £756, shows a reduction of £1185 on that realized for the preceding twelve months. Thus, as is pointed out in the report, though at the beginning of the year there seemed no probability of a contribution to the rates, something has, notwithstanding the fall in consumption and higher wages, been accomplished in this direction. The lighting restrictions were responsible at Dukinfield for a

decrease of nearly 8,000,000 c.ft. in the sales of gas. As to the working results, it is pointed out that, owing to the shortage in coal supplies, the quality had not been up to the standard; and the effect of this has been a considerable decrease in the make of gas per ton of coal carbonized. With a gross profit of £3046, there is on the twelve months' working a loss of £957. The plant at Lancaster is fast approaching the stage at which it will be taxed to its full capacity; and the necessity is recognized for considerable extensions in the near future. The past year's working has resulted in a net profit of £12,409, of which £1000 has gone to the rates; the balance of £11,409 being placed to the reserve fund. A surplus profit is shown at Leeds of £1175, as compared with £14,838 for the previous year. The gross profit, however, is £8025 more than twelve months ago. In the case of Rotherham, there is a decrease—again entirely due to the lighting restrictions—of 1·4 p.ct. in the quantity of gas sold. A gross profit is shown of £15,708, and a net profit of £5883; the latter figure being £1197 less than was realized a year ago.

National Alliance of Employers and Employed.

Mention was made in the course of a recent discussion at the Society of Arts—referred to in the "JOURNAL" a fortnight ago—of an organization named the National Alliance of Employers and Employed. These are days of alliances; but it would be hard to find any combination more desirable in the general interests than that of master and man. Therefore, much may justly be expected of this alliance—in connection with the adoption of the new constitution of which many names well known in the industrial world are noted. Among them are Sir K. Crossley, Bart., Sir R. Hadfield, and Sir Hallewell Rogers, as well as prominent Trade Unionists. The gravity of the prevailing unrest was pointed out by the Chairman (Hon. Frederick H. Jackson) of the meeting at which the constitution was adopted; this gravity being the cause of the effort to strengthen and extend the organization as rapidly as possible. He expressed the view that the constitution of the Alliance should be broad and comprehensive enough to obtain the practical co-operation of everyone associated with the industrial life of the nation in the discussion and treatment of questions affecting labour and employment; the special object aimed at being to secure that "these should be dealt with before they have reached the stage of acute controversy." Other stated objects of the constitution are to promote generally the welfare of the industrial workers of the country and the efficiency of its industries, and to arrange, in conjunction with the proper Departments of the Government, as one of the most urgent problems, for the re-instatement in civil employment at the end of the war of men serving with the forces and munition workers. A resolution was also passed at the meeting urging the Government to abstain in future from action affecting the conditions of manufacture and employment until the joint advice of employers and employed has been obtained, and from interference in industrial disputes until every form of direct negotiation has been exhausted. Such aspirations as these foreshadow a useful and a busy life for the Alliance.

Condensation Plant, Pre-Heaters, &c.

There is much to commend—particularly under present conditions—the issue of their catalogues in sections by manufacturers of wide ranges of gas apparatus; and undoubtedly Messrs. R. & J. Dempster, Ltd., of Oldham Road, Manchester, who are adopting this plan, will find the method a convenient one. We have received from them one of these sections—others will appear as circumstances allow—and it promises well for those that are to follow. In view of the great variety of plant that is made by the firm, the preparation of the complete catalogue, on the comprehensive lines of the present section, will be a considerable undertaking; for the work being put into it is of the best. The apparatus well described and excellently illustrated in the section now before us comprises coolers, condensers, heat interchangers, superheaters, &c. It would seem unlikely that an engineer on the look-out for plant to fulfil any of the purposes named would be unable to find something of the kind required in the sixty odd pages that Messrs. R. & J. Dempster devote to the section.

Communal kitchens and restaurants form the subject of the May number of "A Thousand-and-One Uses for Gas," published by the British Commercial Gas Association. The details and illustrations given of the use of gas apparatus for preparing food on a large scale will prove specially useful just now.

PERSONAL.

Mr. JAMES M'LEOD, Engineer and Manager of the Greenock Corporation Gas-Works, has been appointed General Manager for Scotland of the firm of Messrs. Brotherton & Co., Ltd., tar and ammonia distillers, of Leeds.

We learn with regret that, owing to advancing years, Mr. H. ASHTON HILL, M.Inst.C.E., the Engineer-in-Chief of the South Staffordshire Water-Works Company for over twenty-two years, is contemplating retiring at an early date. Mr. Ashton Hill still continues his membership of the Institution of Gas Engineers, which he took up when Gas and Water Engineer to the Wallasey Corporation.

Before leaving for this country, on giving up his position as Manager at Port Elizabeth for the South African Lighting Association, Ltd., Mr. W. ARNOTT was presented by the employees with an address. In making the presentation, Mr. Sterley said Mr. Arnott had been a comrade and a friend to his colleagues and the men; and he would be sadly missed. It was the earnest wish of the staff, when they heard of his impending departure, to make him a substantial gift; but, anticipating what might have been their intention, Mr. Arnott had expressed a desire that, in these bad times, such a thing should not be done.

A recent issue of the American publication "Gas Record" announces that the son of the President of the Company owning the paper—Mr. JOSEPH M. GRAFFIS—has enlisted for service in France with the American Ambulance Corps, and has sailed from New York for Paris. He is one of the first of the young men connected with the American gas industry to volunteer for active service abroad, and has many friends who will be interested in watching for news of him from the battlefields of France. He is twenty-two years of age and is regarded as a skilful automobilist; so that it is likely he will be called upon to serve in the capacity of ambulance pilot.

ELECTRICITY SUPPLY MEMORANDA.

Food and Fuel Economy.

UNIVERSALLY, our thoughts have been turned by Lord Devonport and his faithful subalterns to the question of the necessity for economizing cereal-derived food; and the spectre of a food famine, with its consequent food rationing, if herein we fail, is brought to bear in urging people into doing what patriotism and commonsense alone should induce everyone to do. But at the rate at which most forms of human provender are taking flights in cost—100 and 200 p.ct. increases are getting so common as to make us begin to feel quite familiar with them—food economy will be forced, without any exhortation from the Food Controller, by the money shortage which those of modest income will be experiencing. Food and fuel economy are things that are closely related. The best possible use has to be made of our fuel to-day; and, with the high prices of food, people do not want to spend more than is necessary upon its preparation. Electrical purveyors, with a bold belief in the credulity of the public, urge that people would therefore do well to adopt electrical operation, and so save expense. It seems that the saving is to be effected by the asserted refusal of meat to shrink to any large extent when interned in an electric-oven—no matter the constitution of the meat, no matter the way the oven temperature is handled. With that disingenuousness which has faithfully accompanied their efforts to get business in this line, they omit to inform people that, using equal temperatures by other means of cooking, this so-called advantage is ruled-out as the sole property of electrical operation. Nor do they say that it is not in the oven that most of the work of food preparation is done, except one of them—a writer in "The Times Engineering Supplement," who lately stated that it is the operation of boiling which calls for "most frequent" application, and who later in the same article showed that the boiling-plates in the electrical equipment are the most inefficient part of it. They do not tell the public that the over-all kitchen operation by electricity is much more costly than by other means, and that electrical appliances cost more initially, and so does their upkeep. The fact that it takes an average of 4½ lbs. of coal (adopting a low figure lately employed by an electrician) to generate a kilowatt-hour of current, which will yield to the user only 3420 B.Th.U., is not a matter about which a song is sung, though coal economy ranks on much the same level of importance as does food economy. But with all this restraint in the telling of the whole truth affecting electrical culinary work, we cannot but admire the perseverance of the makers of electrical appliances in trying to increase their efficiency, and, though a curb has been applied by the circumstances of the war, the persistence with which they attempt to secure their adoption.

Large-Scale Cooking Equipments.

Just lately the manufacturers of gas appliances have been very busy, in quite the ordinary course of business, fitting-up canteens in connection with munition factories, Y.M.C.A. huts, camps, hospitals, and so forth. Some-

thing of the character of this work has transpired in papers and incidentally in articles and advertisements; but, extensive as are some of these installations, there is nothing extraordinary about them in the gas man's experience. Interest lies in the increasing development of this side of the business in connection with works and factories in the betterment of the conditions of the employees. But some of our trade rivals with a relatively modest number—a very modest number—of electric cooking equipments in such places have been talking at large of this being evidence of the moving preference for electrical operation. Much description was given of a canteen fitted up for railway employees. Which railway? The London Underground Electric, one of the administrators of which was Sir Albert Stanley, who is now the President of the Board of Trade, and who lately appointed a Committee to inquire into the means by which cheaper electric power can be generated. If the London Electric Railways cannot supply energy cheaply for cooking purposes, then no one can. They would indeed hardly miss the quantity consumed for the purpose, with such a load and resources as they possess. Accounts have also been published of two or three installations at certain munition factories; and at least one of these is traceable to a factory not unidentified, in normal times and in a measure now, with the production of electrical apparatus. But whatever may be the extent of the unpublished application in the remnant of establishments not occupied by gas equipment, the manufacturers of electric cooking appliances have been busy producing designs of apparatus of all kinds which are considered suitable for use in canteens, hotels, clubs, and restaurants. This is the direction in which it is electrically believed that the employment of electricity will, owing to the amount of the work, come out cheaply; but the strange thing is that, after the installations have been made, there is a peculiar reticence in publishing information as to the costs of operation and maintenance.

Operating and Maintenance Costs.

The costs of operation have relation to the consideration paid in the way of preferential treatment in the matter of charges for current for these large pioneer installations; and there is no publicity as to the kindly and frequent attention paid (which is very necessary in view of the tremendous trouble that will be occasioned by failure in hotel, restaurant, club, or canteen) to the appliances by the electrical people, nor anything as to the cost of repairs. All is dark on these heads; and, if the whole tale were told, it would not be the one that the electrical people would desire. The "Electrical World" of America evidently does not entertain much belief that economy of current will be the recommendation in hotels and such-like places. Chefs, it says, do not desire to economize current. They expect and must have quick cooking; and they will keep grills and boiling plates continuously on circuit from early morning till late at night. By careful manipulation, the writer asserts, half the energy used might be saved. But the chef wants speed, and it is useless to talk to him about economy and kilowatt-hours. He has little use also for intermediate heats. "Everything is kept full blast all day long, and refinements and heat control, so valuable in the home, and so adapted to save current, and to give the best cooking results, are wasted in hotel equipment." What about meat shrinkage under these conditions? In such circumstances too (let alone others) can electricity compete in costs with the rival cooking systems? In this outspoken statement of the "Electrical World," we have one of the reasons why so little publicity is given to the question of costs with these big installations, even on a preferential tariff for the large consumption. But as a set-off, it is stated that "the maintenance of coal or gas cooking plants in an hotel is so much more costly than is the case with electric-cookers of first-class design, that there is no need to worry about the cost of current consumption." The first part of this statement is contrary to fact. The second part is, therefore, a matter of opinion, and our opinion happens to be based on experience which is the reverse of the statement. It is also said that "the heat strains are very severe under hotel conditions; and the elements must be designed to stand the extremes of service." This distinctly discounts the assertion as to the lowness of maintenance costs. When one examines a gas-cooking range, and sees the simplicity of its parts, and then the comparatively complex construction of the electric-cooking equipment, it is self-evident that the maintenance of the latter must be considerably higher than that of the former, especially in regard to the renewal of the elements. Descending from hotel and restaurant work, there is a good experience by gas undertakings of the call on the time of gas-fitters in relieving the vexation of householders who have been tempted to try the electric plan. However, the "Electrical World" has been endowed with a fine optimistic spirit, mixed with caution. It believes the gas-stove is doomed for cooking purposes, unless it can be made to duplicate the results of the electric range. This is a safeguarding addendum to the prediction. And very necessary, inasmuch as our contemporary proceeds to confess that gas maintains its superiority in the cooking field solely because it is cheaper than electricity. And, be it marked, it is looking at the question from the American standpoint, with the very general price ruling of round about $1 for gas, which is not the figure at which the greater portion of gas is sold in this country. But it consoles itself that electricity is constantly becoming cheaper. The British gas industry, too, is looking into the question of the supply of a gas giving a high flame temperature at still lower prices.

Electric Cooking in the Household.

Previous mention has been made of an article in "The Times Engineering Supplement" on the subject of "Electric Cooking and Heating," which frankly states that boiling operations are the most frequent among cooking demands, and later tells the uninformed reader that, notwithstanding, the boiling-plates are the least efficient parts of a cooker equipment. It is pointed out that the light form of oven, constructed of sheet metal tinned or nickel plated, is portable, and, as electric cookers go, cheap. But what is called cheap with them is not what we call cheap with a well-constructed lagged cast-iron gas-oven, with top boiling-plate, and which costs extraordinarily little to maintain. But if light forms of oven are cheap (electrically speaking) in first cost, their operating expenses tend to become weightier with age. Their efficiency, as the writer points out, is dependent upon the polished surface of the casing, which minimizes loss of heat by radiation and convection; and it is therefore essential to maintain the original brightness if low cooking costs are to be expected. We remember some tests with such ovens, which showed that they took much longer (owing to heat losses) to reach a given oven temperature than the heavier cast-iron lagged form, which, of course, is more costly, but has the reputation for maintaining its original efficiency, so long as the elements keep fit and nothing else goes wrong. The writer emphasizes the need in selecting a cooker to have one in which the elements can be quickly replaced *in situ*, as it is very inconvenient to the user (if unfortunately the fickle electric-oven should happen to be the only means of cooking on the premises) for the cooker, when anything goes wrong, to have to be sent away to the maker for repair. The boiling elements attached to electric-cookers have undergone some change. In the past they were of circular form, of cast iron, with ground working surfaces—the elements being clamped together. With these, special vessels having perfectly flat bottoms must be used, in order to ensure good thermal contact. In most cases, the efficiency of this method is low—seldom exceeding 35 p.ct. In other words, 65 p.ct. is wasted of the 3420 B.Th.U. of every electrical unit paid for. With enclosed elements the risk of overheating exists, especially if the plate be run for long without any vessel on the top to absorb the heat generated. The life of such elements is not great; they cannot be easily replaced; their efficiency is low; and they are slow in operation. The latest improvements are elements of the radiant type, which have nickel-chromium wire spirals supported on fireclay studs or discs. These are exposed on the upper side to the air, are surrounded by a circular frame, and are protected on the working side by a stout grid so that they cannot be touched. The writer in "The Times Engineering Supplement" says that "the efficiency of such plates *may* exceed 60 p.ct." Equally they may not; and we know that some have not which have been tried with all the care thrown in of a trained laboratory experimenter. It is stated that spilled liquids pass through the spirals and do no harm. We accept this with some reserve, and suggest that the character of the liquid may have some bearing on the point of accuracy. An advantage undoubtedly is that, as a great part of the heating is carried out by radiation, no special vessels are required for use upon these elements, as is the case with those boiling-plates which insist on being kept in close contact, if a disastrous result to plant and food is not desired.

THE PIONEER COMMUNAL KITCHEN.

Gas-Heated Cooking and Serving Apparatus.

The Ministry of Food has inaugurated a movement which, it is hoped, will have a permanent effect upon the domestic economy and health of the working classes. In most cities and towns it is difficult for the very poor to get properly cooked food; and the better class operatives—this has been the case especially during war time, despite the prevalence of the gas-cooker, which forms an important item in the prepayment installation—have not the time during the day and are too tired in the evening to look after the provision of a hot meal. But if a place is provided in their midst where food is prepared and cooked in large quantities by skilled hands under expert supervision, and can be purchased at a reasonable price, they will gladly avail themselves of it. The communal kitchen thus fills a want; and, good and well-cooked food being procurable there, it should be a contributor to the improvement and maintenance of the local health.

The first public kitchen, which the Ministry of Food trusts will serve as a model for local authorities throughout the kingdom, has been opened at 104*a*, Westminster Bridge Road, S.W.; and Her Majesty the Queen, with Princess Mary, gave it a good send-off yesterday week, and took part on the occasion in the work of serving the cooked food to the buying poor. Next to the gracious interest of Her Majesty, the patronage that the kitchen has had since is a warrant of success, just as it is a guarantee of quality and of good cooking, and withal cheapness. The announcement that in this pioneer public kitchen (which will probably be visited by many who desire to go and do likewise) gas is being used entirely, induced a representative of the "Journal" to spend a little time there on the day succeeding the opening. The kitchen occupies the ground floor of a spacious building, and the store-rooms are below. No one in search of the place can miss it. Its exterior

is in harmony with the spick-and-span interior. The writer was fortunate in not reaching the place when the staff was busy serving the poor customers. The members were quietly and methodically proceeding with their preparations for next day's cooking; under the supervision of Mrs. Adcock, who has organized the kitchen for the Ministry of Food. As head of the Women's Department of the Northern Polytechnic, where they have large kitchens and all sorts and conditions of gas-cooking appliances, she has brought a large experience to bear upon the work of making the most of the place, and arranging operations on systematic lines. Through the war, the obtaining of exactly the appliances she would prefer to have had from the Gas Light and Coke Company has not yet been achieved, and there may be replacements later when the right apparatus is available; but the fact only accentuates the perfection of the arrangements which enabled the kitchen to start straight away on its beneficent service in the manner it has done.

Courtesy itself is Mrs. Adcock. She explained that there was nothing palatial or extravagant about the place. Although a Government institution, it is on a simple, plain, working scale; the object being to make it a realizable standard for all who would undertake similar work. Entering the front door, one is face to face with the pay-desk, running laterally from which is the serving-counter, at which Queen Mary assisted the staff in their work on the opening day. On the serving-counter stood two or three files with the tickets on them which on Tuesday morning had been received at the pay-desk by the customers, and for which the food required for dinner had been exchanged at the counter. In the outside windows, the menu for the day is exposed; so that customers can before entering see exactly what food is being served, and the price to be paid for it. Part of the kitchen is visible to the customers; but, in the main, a partition screens the work from the view of those who are in the serving part of the large room. In fitting-up the place everything had, to an extent, to be regarded as experimental. There was no knowledge of the probable custom; there was no information as to the class of food that would be prime favourite. Everything has to be determined by trial. The apparatus fitted is, as explained, more or less temporary on account of the war, and owing to it being required in a desperate hurry; and so it is not all that would have been selected even experimentally. The difficulty at the outset of exactly deciding on the capacity of the cooking apparatus will be seen when it is explained that, in order to comply with the needs of all who patronize the kitchen, and to facilitate the work (which means a rush during the time of sale), they speak of "portions." No whole meals are served; but a portion of each kind of food on the menu—soup, meat, vegetables, and pudding—can be purchased—just as suits the requirements or (this is an important factor) the pockets of customers, each of whom must bring basin, dish, or plate for his or her purchases. With the present staff, 2000 to 3000 portions can be served per day; by duplicating it, the sales would only be limited by the capacity of the gas apparatus going all the time.

In the serving-room is a gas-heated carving-table, with hot cupboard beneath; and it is of good and convenient size for the work. The maker's name is not visible. Standing near by, is a large-sized hot-plate by the Carron Company. By these aids, everything is served hot to the customers. Passing into the kitchen, is seen one of Wright's steam-ovens for puddings and vegetables; the steam for which is gas-generated. A large oven of the Sugg type is ranged alongside. The stock-pot stand is at present only a make-shift arrangement, pending the arrival of a stand raised from the floor. It heats three large stock-pots. The roasting-oven is of the Davis make. Mrs. Adcock would for this particular class of work prefer one (when available) in two sections—a large oven at the bottom and a small one at the top, so as to save floor space. The roasting-oven is fitted with an outlet-flue. A large hooded frying table succeeds, provided with two tanks for catching the fat. There are three boilers fitted up; but, instead of these, two jacketed ones would be preferred—one of which could be used as a stock-pot, and be left running with small flame all night. However, the present equipment temporarily serves the purpose, and is compact. But there will be some changes, so as to have the place fitted as desired and as experience dictates. In ordinary circumstances, there would have been no difficulty in making right away a suitable (subject to experience) selection of apparatus; but there has been such a run on the large type goods for munition works, camps, hospitals, &c., and the production of munitions at the factories of the makers of gas appliances interferes to such an extent with the pace at which cooking apparatus can be turned out, that the fitting-up of the first public kitchen run on the lines described has been largely a matter of Hobson's choice.

For a beginning, hot food for dinners is being served from 11.30 to 2 o'clock; but later there is to be an evening "session" as well. It was thought better, however, to get thoroughly settled to a midday dinner scheme before entering upon a double daily programme. Everything about the place is beautifully clean; and the work proceeds with mechanical precision. The initial success is a great encouragement; and we hope to see communal kitchens spring-up this summer throughout the land.

Waverley Association of Gas Managers.—The Association will have their 101st meeting, in the Cockburn Hotel, Edinburgh, on Friday, the 8th prox., at 11 a.m., when the President (Mr. James D. Keillor, of Hawick) will deliver an address, which will be open for discussion. High tea will be served at 3 o'clock.

INSTITUTION OF GAS ENGINEERS.

Last Week's Council Meeting.

A MEETING of the Council was held at the offices of the Institution on Tuesday, the 22nd inst.—the PRESIDENT (Mr. A. E. Broadberry, M.Inst.C.E.) in the chair. There was a very good attendance of members.

The following were approved as candidates for membership: Mr. George A. Bamber, of Birmingham, Mr. George Braidwood, of Coatbridge, Mr. Richard T. Surtees, of Newton-le-Willows, Mr. Harold Higham, of Shipley, Mr. William H. Y. Webber, of London, Mr. R. H. Ruthven, of Morecambe; and for associate membership, Mr. Henry L. Bateman, of Merthyr Tydfil, and Mr. Arthur L. Broadberry, of New Southgate. Mr. Charles Chambers, of Harrow, and Mr. G. Trevor Sprague, of Ferndale, were transferred from the class of associate member to that of member.

It was decided to form a "Demobilization Committee," for assisting members of the gas industry of all grades who have joined His Majesty's Forces to return to their respective positions after the war, and to endeavour to arrange that they shall not suffer owing to their absence from their duties. Mr. R. G. Shadbolt has consented to act as Chairman of the Committee, which will consist of the District Members of the Council for the year 1917-18—viz., Mr. J. Terrace, representing the Eastern Counties Association, Mr. H. Kirkham, representing the Irish Association, Mr. G. S. Frith, representing the Manchester District Institution, Mr. C. H. Webb, representing the Midland Association, Mr. J. Lang, representing the North British Association, Mr. W. Hardie, representing the North of England Association, Mr. W. N. Westlake, representing the Southern District Association, and Mr. A. W. Branson, representing the Wales and Monmouthshire District Institution.

The report and recommendations of the Building Committee (which met the previous day) were presented, accepted, and adopted. They will be communicated to the members of the Institution at the forthcoming annual meeting.

The annual report of the Council was considered, and the draft was approved for printing and issuing to the members.

It was reported that the Committee charged with the work for which the Council had recently voted the sum of £450 would be holding a meeting to arrange procedure on the following day, the 23rd inst. It is hoped that some statement on this matter may be ready for submitting at the annual meeting.

A proposal of the Yorkshire Commercial Section of the Manchester District Institution of Gas Engineers, that the annual meeting of the Institution in 1918 be held in London and Paris, was communicated; and it was decided to bring it under the notice of the members at the forthcoming annual meeting.

A communication from the Institution of Heating and Ventilating Engineers was considered, proposing the adoption of certain symbols and abbreviations especially useful in the science and practice of heating and ventilating. It was agreed that the President and Hon. Secretary be appointed as representatives of the Institution of Gas Engineers to discuss the subject.

A proposal was considered for the appointment of a delegate of the Institution to consider a suggestion for the formation of a Board of Inventions. It was decided to nominate the President or his nominee to serve in this capacity.

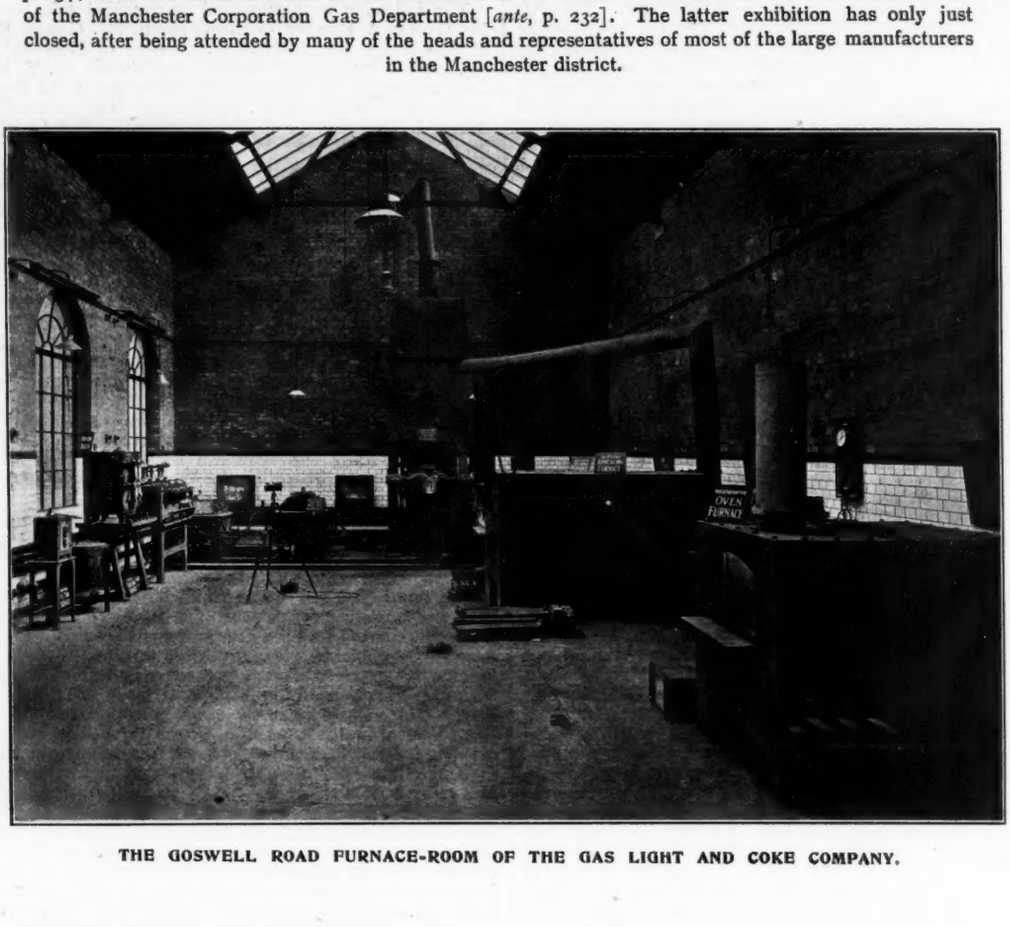
A letter was considered from the Wales and Monmouthshire District Institution of Gas Engineers and Managers, calling attention to the quality of gas coal obtainable in South Wales and Monmouthshire. It was decided that the writer should be referred to Mr. Thomas Glover, of Norwich, in his capacity of Adviser to the Government Department concerned with this subject.

Progress of Applied Chemistry in 1916.—The Society of Chemical Industry forward for review a copy of Vol. I. of "Reports of the Progress of Applied Chemistry," just issued at the price of 3s. to members of the Society and 5s. 6d. to others, post free. Among other contents of the book (which will be reviewed in the "JOURNAL" in due course), are chapters on "Fuel and Heating," by Prof. J. W. Cobb, B.Sc., and "Gas: Destructive Distillation. Tar Products," by Mr. E. V. Evans, F.I.C. The work is published by the Society at Broadway Chambers, Westminster, S.W.1.

The Food Economy Campaign.—In the May issue of the "Bulletin" of the British Commercial Gas Association, "F.W.G." points out that the offer of such help as the gas industry could give in organizing demonstrations in economical cookery, or in disseminating information on food and fuel economy, which was made to those organizing the Food Economy Campaign, was without hesitation accepted. To the Local Committee in over a hundred of the largest towns in the country, the authorities have intimated the receipt from the British Commercial Gas Association of the assurance that gas managers generally would be glad, so far as their depleted staffs permit, to co-operate in the campaign for food economy by all means within their power. As a consequence, many members of the Association have, it is gratifying to learn, been co-opted; and active co-operation between the industry and the organizers of the campaign is the order of the day. The Association have prepared some suggestions as to how members can help in the campaign; and a copy of these is included in the "Bulletin."

TWO RECENT GAS-FURNACE DISPLAYS.

The accompanying photographs illustrate the arrangement of the gas-furnaces in connection with two exhibitions and demonstrations lately undertaken by Messrs. John Wright & Co., of Birmingham. One shows some of the apparatus installed at the Goswell Road furnace show-room of the Gas Light and Coke Company, on the occasion of the exhibition which was noticed in the "Journal" for April 24, p. 134; while the other is a view of the exhibition in the furnace show-room at Whitworth Street West of the Manchester Corporation Gas Department [*ante*, p. 232]. The latter exhibition has only just closed, after being attended by many of the heads and representatives of most of the large manufacturers in the Manchester district.



THE GOSWELL ROAD FURNACE-ROOM OF THE GAS LIGHT AND COKE COMPANY.

THE GAS-FURNACE SHOW-ROOM AT WHITWORTH STREET WEST, MANCHESTER.

THE "LANGHAM-CENTRAL" GAS-COOKING RANGE AT THE UNION CLUB.

Approval by Chefs of External Heating.

"CUSTOM is hard to kill," runs the axiom; and nowhere is the truth of this better exemplified than in the kitchens of hotels, clubs, or restaurants. Coal—with all its dust, dirt, smoke, labour, dislocation occasioned by the visits of sweeps, the disuniformity of result through variable temperatures, the harm to dripping and gravies owing to vagrant ash and dust—long held sway; but the dislodgment by gas of these disadvantages has been proceeding now for some years and the pace quickens with the accumulation of experience. Gas once tried, there is no reverting to coal—particularly in these days when the early forms of large gas ovens and other appliances for establishments with big cooking demands have become old-fashioned, and modern improvements have swept away all the old objections, and put into the hands of the chef an instrument in his operations which he can make respond to the dictates of his will with the utmost ease.

We should like to get those chefs who still cling to barbarous coal heating into the kitchen of the Union Club in Trafalgar Square, and have them listen to the experiences of the chef there, who, with his assistants, is enthusiastic over the change from archaic coal heating to the modern gas method. Those chefs who saw and heard would leave with an appraisement of modern gas methods entirely different from that held before. A representative of the "JOURNAL" has been to the Union Club, has seen and has heard, and has come away impressed by the fact that the chef has finally and irrevocably passed from coal to gas operation, and that nothing can disturb him in his new-formed resolutions founded upon experience. The experience has been gained with the "Langham-Central" gas-range, which is the first installation of its kind in the country, and is a noble looking structure. Although it has only been there a short time, the chef knows his new auxiliary in all its detail; and its responsiveness to his every requirement, its capacity on the enclosed hot-plate and in the ovens, and its operating elasticity, are points on which he spoke freely and voluntarily. Experience with the new range only makes the disadvantages of the old deposed coal predecessor stand out even more strikingly than they did before the means of comparison had been provided. The old coal-range, besides not being so accommodating as the new gas-range, appeared to have suffered from all the ills and disadvantages that coal-ranges could possibly be heir to; and it and its appurtenances, in addition to all the labour and disability they imposed, were responsible for no small amount of "moral and intellectual damage" among the kitchen staff. In extenuation, it may be said that range and appurtenances were not discarded until full of years.

DESCRIPTION OF THE NEW "LANGHAM-CENTRAL" RANGE.

The installation of the Langham-Central gas-range at the Union Club will at once be recognized as the work of Messrs. Fletcher, Russell, & Co., Ltd., who have made a speciality of the external heating of large gas-ovens with enclosed hotplates; and the installation was carried out by them in conjunction with the Gas Light and Coke Company. "Langham" ranges, in which the principle of external heating was first applied by the firm, are not new; and with their coming, and the removal of the gas-jets from inside the ovens, there disappeared the main objection which many chefs rightly or wrongly previously held to gas-heated ovens. This has gained favour for these ranges, as is evident by scanning the list of installations in London which include the Langham Hotel (where it prevented the entrance of electric cooking), the Bucklands Hotel, Saddlers' Hall, the London, National, Empire, and Samaritan Hospitals, King's College for Women, the Four Hundred Club, and now the Union Club, as well as the Norfolk Hotel, Brighton. There has been complete success with the ranges in these and various other places. At the Union Club all the good points and more of the former constructions of the "Langham" range are incorporated in the "Langham-Central." It derives its hyphenated name from the fact that it is situated centrally in the kitchen. There is no hood to it and no visible flues, so that the whole structure can be got round without hindrance, and every inch of the hot-plate is available for service just as required. The absence of visible flues is due to the fact that the downward and underground flues which formerly did duty with the coal range have been utilized without reconstruction—no difficulty whatever having been experienced in making the adaptation. A general inspection gives satisfaction. The range is another step along the road of gas progress. The structure bears the "good workmanship" stamp of the makers in its main parts and in its details—solidarity which foretells longevity, detail which promotes convenience and utility, and finish which gives good appearance. There are six externally heated ovens in the range, three on each side—four being 27 in. by 18 in. by 24 in., and two 20 in. by 18 in. by 24 in. The overall dimensions of the range are 8 ft. 3 in. by 6 ft. by 2 ft. 11 in. high. The flue runs longitudinally down the centre, with a partition which forms a separate duct for the products of combustion from either side. This type of range can, of course, from the standard sizes of oven adopted by the firm, be built-up to any size, or to special sizes so as to meet unusual requirements.

THE HOT-PLATE AND HEAT CONSERVATION.

As already mentioned, the hot-plate is entirely enclosed; and the chef at the Union Club speaks highly of its large range of utility. Constructed in stout cast iron, the hot-plate is framed and panelled with section plates. The burners under the plates are so arranged that any temperature desired may be obtained on any part of the hot-plate. The whole of the surface (this is an improvement on the old fixed position heating) may be utilized for either boiling or simmering; the heat in all parts being easily controlled. And the vessels can be slipped about in any direction and to any spot without lifting—in short, the flexibility leaves nothing to be desired. This was not the case with the old coal range. There was fierce local heating, and not the distributed heating which gives so much appreciated scope. Our friend the chef bears witness that all this goes to make for an economy which he could not realize under the past conditions with coal heating. When the plates have been thoroughly heated, alternate burners may be turned out; and it is often found possible to extinguish all the burners under alternate plates, and still retain a sufficiently high temperature for the different classes of work in hand. The structure with the internal flues and the enclosed hot-plate lead to a heat conservation which is an economic consideration, and adds to the working value of the range. For instance, the chef opened the door of an oven not in use. There was quite a decent temperature in it, transmitted from the hot-plate and the waste heat from the flues. This preheating without special consumption is useful, when so many and large operations are proceeding, and prompt use is necessary. The retention of heat too in the ovens after their own burners are extinguished continues for quite a long time; and this, too, is valuable for various purposes, besides shortening the time for raising temperatures again to the requisite point when the next meal is in course of preparation. The temperatures in the ovens can be regulated to high, medium, or low as desired. Regulation and the intimate knowledge of the chef of his range mean gas economy. Reflector indicators show when the ovens are alight.

THE QUESTION OF HEATING-UP AND CONSUMPTION.

This point led to an inquiry as to the experience regarding the length of time required in heating up, starting cold in the morning. Our informant's reply was: "We can use the ovens almost immediately; but probably to heat them up to the working temperatures would not take more than twenty minutes." "How does that compare with the coal range?" The answer was that it took from two to three hours to get the coal-heated ovens hot, beginning cold, besides which, whether the range was wanted or not, once lighted in the day it had to be kept going, with the result that coal was wasted, and the ovens stood at their best temperatures just when nothing was required of them. But the chef pointed out that this was not the only point. There were the questions of labour, of lighting-up, and of cleaning, of flue sweeping, of coal storing and handling, and of the variation of temperature produced when the fires were re-stoked. Labour is minimized and the absence of dust and dirt is an assurance against injury to the food from these sources. The consumption of gas works out to approximately 6000 c.ft. per day; and as experience is accruing, there may be still further economy. This compares with a consumption of about 12 tons of coal per fortnight (priced recently at 38s. per ton), for the central range, open fire, and boiler, with two or three sacks of charcoal per day for the grill, costing about 6s. a day—the size of each sack being equal to a ½ cwt. coal bag. The amount of solid fuel now used in addition to the gas is only something like 4 tons in the fortnight; so that in coal alone, without reckoning charcoal, the purchase, delivery, storage, handling, and use of 8 tons per fortnight have been discontinued. This is decidedly satisfactory to all concerned, supplemented as it is by relief from labour, dust, and dirt and other inconveniences, while gaining also in general cleanliness, rapidity, and flexibility, which save time and vexation.

ON BAKING RESULTS.

Speaking of the cooking results, the chef was all praise. The power of regulation is a great point. Cooking in ovens externally gas-heated, he finds that, when once the proper temperature is reached, a comparatively small amount of gas suffices to maintain the temperature to the required degree. So baking fairly slowly, the meat, he says, is equal in all respects to joints roasted before an open fire or in the old baker's oven; and he is certain that, through attention to the regulation of the temperatures, the joint out of the gas-oven is greater in weight than out of the coal-heated oven, which has not the same convenience in heat adjustment. He prefers, too, the dripping from the joint baked in the externally gas-heated oven. There is uniformity about it; whereas with the old coal-heated oven the fat sometimes got burnt, and spoilt the dripping, besides which it was not always so clean as now. Reverting to the question of capacity, he mentioned that he had more oven capacity now at hand on the same ground space than he had in the old central coal-range; and this greater capacity is at once a convenience and an economy.

A VERY REAL SUPERIORITY.

Now what does this all mean? The responsibility of the chef is not a whit less now than before; but the responsibility with the "Langham-Central" gas-range is mixed with considerably less anxiety. The time occupied with the coal-range difficulties can

now be devoted to details that enhance result. There may not in normal circumstances be any marked difference between bare fuel costs; but it has been seen that there is a large margin of superiority in the gas-range over the coal-range subscribed to from several directions. This margin of superiority rules from day to day, and week by week; and, at the end of the year, it all means money, which is not shown by any difference in the fuel bill alone, which bill the gas-range allows to be varied to a greater extent as the quantity of work changes than did the less flexible coal-range.

DEVELOPMENT OF GAS-FURNACES FOR INDUSTRIAL WORK.

By Thomas W. Fletcher, Chairman of Fletcher, Russell, & Co., Ltd., of Warrington.

[Second Article.]

As explained in my previous article [see "Journal" for May 7], the advancements in gas-heated apparatus of all sorts for industrial purposes have been enormous, and have materially helped to assist in the prosecution of the war. When the veil of secrecy—so necessary at present—has been withdrawn, it will greatly surprise and interest the public to know of the innumerable uses that have been made of coal gas as a fuel, and the marvellous results that have been achieved, especially in comparison with the older methods.

To return to its application for commerce and the arts of peace generally, the development has grown in a wonderful manner during the last thirty or forty years. This is especially marked in towns where there have been concessions made in the price of gas for power and heating, apart from the ordinary domestic and lighting supply. To give an idea as to the growth in the direction named, it is an interesting study to review the following record of merely the various standard types of furnaces (apart from the specials) which gives the largest size manufactured during each decade, together with its hourly maximum gas consumption.

Previous to the year 1880, the largest gas-heated muffle-furnace made and used in specialized high-class trades was fitted with a muffle 7 in. wide × 6 in. high × 12 in. long. It was supplied with a burner that had a maximum gas consumption of 38 c.ft. per hour; while the largest gas-heated crucible furnace made was supplied with a crucible holding a charge of about 6 lbs. of metal, and was fitted with a burner to work with low-pressure gas and to consume about 22 c.ft. per hour.

BETWEEN 1880 AND 1830 FURNACES GREW TO:

Muffle Furnace—12 in. × 6 in. × 14 in. Gas consumption, 110 c.ft. per hour.

Tube Furnace.—30 in. long × 1 in. diameter. Gas consumption, 75 c.ft. per hour.

Crucible Furnace—28 lbs. capacity. Gas consumption, 100 c.ft. per hour.

BETWEEN 1890 AND 1900:

Muffle Furnace—3 ft. × 3 ft. by 2 ft. Gas consumption, 650 c.ft. per hour.

Oven Furnace—5 ft. × 3 ft. × 12 in. Gas consumption, 1100 c. ft. per hour.

Tube Furnace—8 ft. long × 10 in. diameter. Gas consumption, 460 c.ft. per hour.

Crucible Furnace—120 lbs. capacity. Gas consumption, 300 c.ft. per hour.

BETWEEN 1900 AND 1910 FURNACES GREW TO:

Muffle Furnace—5 ft. × 24 in. × 18 in. Gas consumption, 900 c.ft. per hour.

Oven Furnace—6 ft. × 4 ft. × 30 in. Gas consumption, 1400 c.ft. per hour.

Tube Furnace—16 ft. long × 15 in. diameter. Gas consumption, 2000 c.ft. per hour.

Crucible Furnace—300 lbs. capacity. Gas consumption, 500 c.ft. per hour.

The "Double Deck" muffle furnace was introduced about the year 1908; while at the present day we are constantly manufacturing:

Muffle Furnaces—8 ft. × 5 ft. × 3 ft. 6 in. Gas consumption up to 1500 c.ft. per hour.

Oven Furnaces—9 ft. × 9 ft. × 2 ft. 6 in. Gas consumption up to 2000 c.ft. per hour,

Tube Furnaces—22 ft. long × 2 ft. 6 in. diameter. Gas consumption up to 4500 c.ft. per hour.

Crucible Furnaces—600 lbs. capacity. Gas consumption up to 1200 c.ft. per hour.

These show a very striking contrast between (say) 1877 and 1917. The progress made in the construction of muffle-furnaces is very marked from the original patterns of the early eighties, with their single burners fitted with the troublesome gauze and cold mouth to the muffle. The body of the furnace was also constructed in one piece, to be patched-up in the best way possible when worn or damaged—and well some of these old bodies stood time and hard wear, when properly attended to, as many can testify to this day. The up-to-date patterns are now supplied with a whole battery of burners, each independently fitted with gas-tap and air-regulator; while the whole series are again under control from a main or "dial" tap, and the gauze is entirely absent. The body, except in the smallest sizes, is fitted up in sections or built of standardized bricks of special material, thus making repairs and renewals of parts a very simple and economical matter. There is no longer a cold mouth to the muffle; the heat throughout being absolutely equal, but at the same time under perfect control, so that the temperature may be varied at will; and with very little experience, low or high, slow or rapid, oxidizing, neutral, or non-oxidizing heats may be obtained and maintained by anyone. All our furnaces are made as nearly "fool-proof" as machines well can be; and we always endeavour to maintain efficiency with simplicity—rejecting wherever possible ultra-scientific or showy and unnecessary accessories. Under this category come the "oven" furnaces, which are merely muffle furnaces without the inner top lining.

Crucible furnaces have developed from the tiny (but efficient) original designs, built also in one piece and fitted with a gauze-covered burner. Taking the blast-pattern (which is now the one most universally preferred), the flame from the burner was first applied direct to one side of the crucible, thus causing local heating and wear to the crucible. Nowadays the heating is done concentrically—an application invented and patented by us so far back as 1897, and doing away with the objections named. Also a secondary chamber is utilized in the built-up body, which gives a regenerative heat in the furnace. The temperature and virtue of the flame are under absolute control in the same manner as in the muffle furnaces.

There are now so many forms and applications of crucible furnaces that it would require a special article to deal with them. But here, again, we endeavour to maintain the highest standard of efficiency, simplicity, and strength of construction. We avoid unnecessary complications as well as cumbersome bodies, which both add to the first cost, waste gas (through the heating-up of an unnecessary amount of material), and require extra skill and supervision for their maintenance.

Probably the tube furnaces have proportionately increased in dimensions more than any other patterns. The originals were mere toys in comparison, taking tubes measuring 24 in. long × 1 in. diameter for organic analysis. To-day the designs and patterns are innumerable. The vertical, horizontal, and inclined forms are used for all manner of processes in various trades. Bar and rod heating furnaces would again require a special page to describe, and are now made up to 20 ft. long × 5 ft. wide.

Gas-heated forges are too numerous to individualize; but it is interesting to note that the only forge that can successfully be used for welding purposes was originally designed and patented by us in 1907; while high-speed steel for machine tools, &c., undoubtedly owes its success to the manner in which it can be heated in gas-heated furnaces. This was demonstrated before the Society of Engineers in one of our high-temperature furnaces fitted with a pre-heating chamber shortly after high-speed steel was first introduced.

Drying ovens, externally and internally heated, jacketed and otherwise, we have made from the original 6 in. × 6 in. × 6 in. to 13 ft. 6 in. × 13 ft. 6 in. × 8 ft.

Furnaces fitted with all manner of labour-saving devices, automatic and otherwise, have been designed and constructed to meet strange and interesting requirements; but these again are too numerous to mention.

I hope these notes will be of some interest and give an insight into the really marvellous development that coal gas for trade purposes has reached. It is certainly no mushroom growth since the war started.

There is no doubt that the gas profession generally owes a great debt of gratitude to the lead given by the writer's father in making these advancements; while the benefit the country has derived through the help given towards the output of munitions has been very material.

Lighting a Bowling Alley by Gas.—The Washington Gas Light Company, according to the "Gas Age" [New York] recently completed a gas lighting installation in some bowling alleys in that city. There are four alleys, and they are illuminated by eighteen lights equipped with angle green-steel reflectors. Fourteen of the lights are installed on two rows of outlets between each pair of alleys. The remaining four lights are placed 5 ft. in front of the head-pin in each alley. The spacing of the other six lights is graduated from the lights over the head-pins, and is arranged in 1 ft. differences from 4 ft. 6 in. to 10 ft. 6 in., bringing the last light 5 ft. 6 in. in front of the foul line. The first five lengths are also graduated in height from 5 ft. 3 in. to 6 ft. 3 in.; and the remaining lights are hung at a height of 6 ft. 3 in. This layout provides a uniform illumination, with scarcely any glare in any portion of the alleys; and the intensity of illumination shows a decided increase as the head-pin is approached.

INSTITUTION OF GAS ENGINEERS.

ANNUAL REPORT OF THE COUNCIL, 1916-17.

In opening their report on the work of the Institution during the past year, the Council say they cannot refrain from referring in the first place to the gratification which they feel, and which they are sure is shared by the industry as a whole, at the continued and the increasing help which has been rendered to the High Explosives Department of the Ministry of Munitions by the gas undertakings of the country in supplying the essential products for the manufacture of high explosives. That the Director-General of Explosives Supply, the Rt. Hon. Lord Moulton, K.C.B., F.R.S., appreciates this assistance is evident from the fact that he has consented to be nominated for election as an honorary member of the Institution and as President for the year 1917-18. The Council consider that the correspondence which has passed between the Institution and his Lordship on this matter should be placed on record. [See "Journal" for May 15, p. 279.]

America our Ally.

By direction of the President, a letter was sent from the Institution to the American Gas Institute on the occasion of the entry into the war of the United States of America as our Ally.

Government Reconstruction Committee.

In compliance with a request received from the then Prime Minister, the Rt. Hon. H. H. Asquith, M.P., particnlars have been collected from the gas undertakings of the country as to the probable position after the war of those young men who, at the time of joining His Majesty's forces, were undergoing training as gas engineers. The particulars asked for were as to the number who have joined; the number who have been killed or disabled; the number who are ineligible for military service, and who are still pursuing their training; and as to arrangements made in regard to the completion of the course of training of those who have joined, on their return to their civil duties.

Demobilization Committee.

The Council have appointed a Demobilization Committee for the purpose of assisting members of the gas industry of all grades who have joined His Majesty's forces to return to their respective positions after the war, and to arrange that they shall not suffer owing to absence from their duties. The Committee consists of Mr. R. G. Shadbolt as Chairman, and the District Members of Council for the year 1917-18—viz., Mr. J. Terrace, of Grimsby (Eastern Counties Association), Mr. H. Kirkham, of New Ross (Irish Association), Mr. G. S. Frith, of Runcorn (Manchester District Institution), Mr. C. H. Webb, of Stourbridge (Midland Association), Mr. J. Lang, of Alexandria (North British Association), Mr. W. Hardie, of North Shields (North of England Association), Mr. W. N. Westlake, of Exeter (Southern Association), and Mr. A. W. Branson (Wales and Monmouthshire Institution).

Enlistment of Gas-Works Employees.

The aspect of the recruiting question has been kept well in view by the Council during the year. They fully appreciate the urgent need for every available man of military utility, and are confident that every gas undertaking has readily responded to the call. The vitally important national work of high explosive production which the undertakings are engaged upon must, however, not be abated. Sufficient men must be left for the purpose. The Ministry of Munitions realize this; and the Council are glad to notice that recent representations of the National Gas Council on the subject are having the desired effect.

British Prisoners of War Book Scheme.

The Institution was invited by the Committee of the British Prisoners of War Book Scheme (Educational), of which Mr. Alfred T. Davies, J.P., is the Chairman, to assist them in obtaining books which would be useful to some British prisoner who has had the misfortune to fall into the hands of the enemy, or who has been otherwise interned. The Council gladly placed the facilities of the Institution at the disposal of the Committee, and would now ask any member who has any technical books that he could send for the above purpose to forward them to Mr. Davies, addressed Board of Education, Whitehall, and marked on wrapper, "Prisoners of War."

Membership.

The Council regret that they have to record the loss by death of the following members:

James Chapman	Harrow.
William D. Child	Romford.
William C. Dawson	Nottingham.
William Ewing	Magherafelt.
Frank Frederick Farrand	Ryde.
Mark Fligg	Redcar.
A. Morton Fyffe	Blackburn.
William King	Liverpool.
John Gibson Newbigging	Manchester.
Charles Nickson	Manchester.
William H. Nutter	St. Annes.
Samuel Wood	Torquay.
Sir Corbet Woodall, D.Sc.	London.

The loss of Sir Corbet Woodall is severely felt by the whole industry. He occupied the position of President on three occasions—in 1878, 1897, and in 1913 (Jubilee Year). His interest in it manifested itself in a number of directions, including the establishment of a scholarship, tenable at the University of Leeds, for the benefit of students of the Institution.

The usual comparative statement shows that at the close of the year 1916 the total number of names on the register was 867, as against 870 for the previous year. The additions consisted of one honorary member, seventeen members, seven associate members, and one student. Eight members were transferred from associate membership to full membership. This year to date eight more have been similarly transferred.

The following distinctions have been conferred upon members of the Institution: Captain H. Riall Sankey, R.E., has received the honour of a Companionship of the Order of the Bath; Mr. Dugald Clerk, D.Sc., F.R.S., has been re-elected Chairman of the Council of the Royal Society of Arts; Professor (now Lieutenant-Colonel) Arthur Smithells, F.R.S., has been selected, on account of his eminent position in the chemical world, to undertake the direction of an invaluable department of the Army's organization. Both these gentlemen have been elected members of Council of the Royal Society. Professor Harold B. Dixon, F.R.S., has been acting as Adviser to the Trench Warfare Department, and as an organizer of the Chemical Section of the Royal Engineers. He is also chiefly engaged as Inspector of High Explosives for the Manchester area. Professor John W. Cobb occupies a similar position in the Leeds area.

Honorary Membership.

The Council have nominated the following for election to Honorary Membership of the Institution:

The President of the Société Technique de l'Industrie du Gaz en France.
The Right Hon. Lord Moulton, K.C.B., F.R.S., Director-General of Explosives Supply, Ministry of Munitions of War.
Sir Arthur M. Duckham, K.C.B., Chairman of the Advisory Committee of the Ministry of Munitions.
Sir George Beilby, F.R.S., Chairman of the Board of Fuel Research of the Committee of the Privy Council for Scientific and Industrial Research.
Mr. W. H. Perkins. Ph.D., Sc.D., M.A., LL.D., F.R.S., Professor of Chemistry, University of Oxford.
Mr. J. W. Mellor, D.Sc., Principal of the Central School of Science and Technology, Stoke-on-Trent.

Accounts.

The Finance Committee—consisting of the President, Vice-Presidents, and Hon. Secretary (*ex officio*), and Messrs. J. W. Auchterlonie, John Bond, F. W. Goodenough, Hubert Pooley, and S. Y. Shoubridge—report upon the financial position of the Institution at Dec. 31, 1916, as indicated by the accounts, duly certified by the Auditors, Messrs. Wood, Drew, and Co. The Council regret to record the death of Mr. J. L. Chapman, who had acted as Hon. Auditor of the Institution since the year 1905. The sum of £1000 has been invested in the new War Loan from the various funds of the Institution.

Library.

A list of donations to the library received during the year is given. The Council gratefully acknowledge these gifts, and hope that members will continue to contribute works of interest to increase the value of the library.

Annual General Meeting.

The fifty-third annual general meeting of the Institution was held at the Institution of Civil Engineers, London, under the presidency of Mr. John Young (the Engineer and Manager of the Hull works of the British Gas Light Company) on Tuesday, June 6, 1916.

Affiliation.

During the year 1916-17, the District Gas Associations affiliated with the Institution have been represented on the Council as follows: Eastern Counties Association, Mr. W. B. Farquhar (Ilford); Irish Assooiation, Mr. A. S. Brook (Lisburn); Manchester District Institution, Mr. W. Whatmough (Heywood); Midland Association, Mr. C. H. Webb (Stourbridge); North British Association, Mr. A. Masterton (Edinburgh); Southern District Association, Mr. W. Doig Gibb (London); Wales and Monmouthshire District Institution, Mr. H. D. Madden (Cardiff).

District Associations.

A number of communications on a variety of subjects have been considered by the Council during the year from the District Associations, and from the Commercial Sections connected therewith. Assistance and information have been given which have elicited appreciative acknowledgments.

Examinations in Gas Engineering, Supply, and Fitting.

In the City and Guilds of London Institute Examinations in "Gas Engineering," 89 candidates presented themselves this year. Of these, 32 entered for the Final paper, and 57 for Grade I., as compared with 108 for the previous year, consisting of 46 in the Final, and 62 in Grade I. Mr. Samuel Glover, of St. Helens, is the Examiner in this subject.

Mr. Walter Hole, the Examiner in "Gas Supply," reports that 72 candidates presented themselves—24 in the Final, and 48 in Grade I. In the previous year there were 95 candidates, consisting of 37 in the Final, and 58 in Grade I.

The Examiners in "Gas-Fitting," Mr. Henry Kendrick and Mr. Ralph Halkett, report that for the examinations this year there

were 88 candidates, of whom 7 sat for the Final, 17 for Grade II., and 64 for Grade I. The total for the previous year was 147 candidates, consisting of 36 in the Final, 65 in Grade II., and 46 in Grade I.

The prizes offered by the City and Guilds of London Institute in connection with the examinations for 1916 were awarded as follows: In "Gas Engineering:" H. H. Brown (Southampton), first prize and silver medal in the Final examinations; W. A. Barnett (London), second prize, Final, silver medal; Berkeley Secker (Worcester), first prize, Grade I., bronze medal; H. B. Holliday (East Ham), second prize, Grade I., bronze medal. In "Gas Supply:" H. W. Clarke (Southampton), first prize, Final examination, silver medal; F. W. J. Belton (Manchester), second prize, Final, silver medal; R. D. Holgate (Woolwich), first prize, Grade I., bronze medal; J. P. Thompson (Barnoldswick), second prize, Grade I., bronze medal. In "Gas-Fitting:" C. D. Walker (London), first prize, Final, silver medal; F. W. Webb (London) and A. W. Halbert (Cardiff), second prize (equal), Final, silver medal; Thomas Salt (Wolverhampton), first prize, Grade II., bronze medal; C. T. Wright (London), second prize, Grade II., bronze medal.

The prizes offered by the Society of British Gas Industries in connection with the examinations for 1916 were announced in the "Journal" for July 25, p. 154.

It is of interest to note that for the first time a candidate in "Gas-Fitting" has been examined in New Zealand. The examination took place at Christchurch, and the examinee was successful.

With regard to the examinations in "Gas-Fitting," a proposal was made by the City and Guilds of London Institute, and approved by the Council of the Institution, that in the circumstances occasioned by the war the regulation be waived which stated that candidates in Grade II. must have passed in Grade I., and that candidates in the Final must have passed in Grade II., provided that the candidate has served at least four years' apprenticeship to the trade.

Mr. Kendrick tendered his resignation as Examiner in "Gas-Fitting." The Council, in accepting it, placed on record their high appreciation of the valuable services he has rendered, not only as Examiner, but in connection with the inception and development of the examinations.

As a result of representations, the following clause has been inserted in the syllabus for the examinations in "Gas-Fitting" of the City and Guilds of London Institute: "With his application for entry to the examination, each candidate will be required to furnish a certificate signed by his employer, stating that the candidate has been engaged for not less than twelve months in the practice of gas-fitting, and that he is considered to be a fair workman."

Institution Certificates for Gas-Fitters.

Appended to the report is a list of 156 recipients of the Institution certificates for gas-fitters. The total number of certificates now issued is 305.

Refractory Materials Committee.

The Institution representatives on the Refractory Materials Joint Research Committee consist of the President, Vice-Presidents, and Hon. Secretary (*ex-officio*), and Messrs. H. G. Colman, D.Sc. (Chairman), J. Ferguson Bell, F. J. Bywater, J. W. Cobb, J. A. Harker, R. Lessing, W. S. Morland, W. B. Randall, S. Y. Shoubridge, Alex. Wilson, H. W. Woodall, and J. P. Leather (Vice-Chairman and Acting Hon. Secretary).

The Committee report that the investigation of the question of the differences of size in bricks when cold and when at high temperature has been continued during the past year; and the results obtained by Dr. Mellor are appended to their report, as are also the results of an examination into the question of the effect of oxidizing and reducing atmospheres on the permanent contraction or expansion of refractory materials. The research on the effect of load on refractoriness using larger samples has been continued. This is not yet completed; many unforeseen difficulties having been met and overcome. It is anticipated that the work will be completed by the end of this year.

Much progress has also been made in the manufacture of special bricks for testing purposes, in which all details were known as to the nature of the materials employed and the method of manufacture; some 30 to 40 tons of six different representative fire-clays having been now worked into finished bricks fired under known and controlled conditions. The provision of the further apparatus required has proceeded steadily but slowly, owing to difficulties of obtaining delivery. The furnace for the investigation of the action of flue dust on refractoriness and life of materials is almost complete; and work on this matter will be commenced shortly. The furnace for investigating the effect of a reducing atmosphere on refractoriness is not yet available.

As soon as the state of the apparatus justified the Committee in doing so, a whole-time qualified assistant was appointed to carry out the work; and further assistance will be given as the nature of the work renders it necessary—the sum now available for the Committee's work permitting of this. The Institution and the Society of British Gas Industries have each increased their contribution for 1917 from £50 to £150; and the Privy Council Committee for Scientific and Industrial Research have increased their grant from £130 to £300 for 1917. In order to afford the opportunity for inspecting the apparatus being used at the Central School of Science and Technology, Stoke-on-Trent, the Council and the Joint Refractory Materials Committee held a meeting there on May 8. Dr. Mellor received them; and the occasion was of very great interest.

Proposed Organization of Refractory Material Research.

At the instance of the Iron and Steel Institute, a movement is on foot having for its object the formation of an organization representing all the industries which make use of refractory materials. The Institution were invited to take part in considering the proposal, and have appointed Dr. H. G. Colman and Mr. J. P. Leather as representatives. They have attended a conference on the subject, reference to which will be found in the report of the Joint Refractory Materials Committee of the Institution and the Society of British Gas Industries.

Scientific and Industrial Research.

The Institution was invited to join in a deputation to Lord Crewe, the President of the Committee of the Privy Council for Scientific and Industrial Research, to lay before him the pressing necessity for increasing the grant voted by Parliament for the purposes of scientific and industrial research. The President attended, and reported that his Lordship was most sympathetic in his reception of the deputation, and promised to fully consider all the facts which had been brought under his notice.

General Engineering Research Committee.

In regard to the formation of a General Engineering Research Committee, to which reference was made in the Council's report of 1913-14, a communication has been received from the Institution of Mechanical Engineers, who originated the idea, stating that, in view of the work now being undertaken by the Government Department of Scientific and Industrial Research, the Institution had decided that no further steps should be taken towards the formation of such a General Committee, and that the information already collected by the Committee will be transmitted to the Government Department.

Board of Scientific Societies.

A letter has been received from the Board of Scientific Societies stating that the Institution of Gas Engineers has been added to the list of Constituent Societies, and asking for the nomination of a representative. The Council resolved that the President for the time being be appointed to serve in that capacity.

Gas Lighting, Heating, and Ventilation Research Committee.

This Committee (formerly the Ventilation Research Committee)—consisting of Professors A. Smithells (as Chairman), J. W. Cobb, J. B. Cohen, and Mr. S. R. Thompson, representing the University of Leeds, and Messrs. John Bond, J. H. Brearley, E. W. Smith, and Chas. Wood representing the Institution—have met three times during the year. They have also had a joint meeting with the Emergency Committee of the Council for the discussion of research proposals; and Prof. Cobb and the Secretary attended by invitation the meeting of the Council at Stoke-on-Trent on May 8.

The resignation of Mr. Harrison (Research Chemist), and the feeling of the Committee that the work on ventilation, though undoubtedly of primary importance in normal times, was not of a character which would justify the appointment of another Research Chemist now for carrying it out, brought the activities of the Committee in this particular direction to a close for the time being. New proposals for research were, however, submitted to the Council of the Institution during the year, and received their endorsement and approval. A grant of £450 was made to the Committee for the appointment of a Research Chemist, and to cover necessary expenses. The primary and most important subject of the proposed research is the "Comparison of Different Grades of Gas within the Limits regarded as at all practicable in the Gas Industry as to their Efficiency in Use." Heating (Domestic and Industrial) and Lighting are both to be considered; and therefore the gas-fire, the incandescent burner, and the industrial furnace will be examined in turn.

Life of Gas-Meters Research Committee.

The Joint Committee consists of Messrs. J. Bond, A. E. Broadberry, S. Glover, W. R. Herring, W. E. Price, R. G. Shadbolt, and J. Young, representing the Institution, and Messrs. T. A. Broadhead, F. G. Cockey, F. Templer Depree, Thomas Glover, W. H. Johnston, and F. R. Smith, representing the Society of British Gas Industries, and Mr. A. Stokes. The Committee report that, recognizing the desirability of collecting statistics bearing on the mechanical aspect of the research, a series of questions was drawn up and issued to the engineer of every gas undertaking in the United Kingdom. The replies to this inquiry are being tabulated, with a view to being reported to the members at the annual meeting.

Advisory Committee on the Livesey Professorship of Coal Gas and Fuel Industries at the University of Leeds.

Mr. W. Doig Gibb has been appointed to act as one of the representatives of the Institution on this Committee, in the vacancy caused by the death of Sir Corbet Woodall.

Institution Gas Research Fellowship.

This Fellowship has been suspended during the past year, on account of war conditions; but some work has been done on the

decomposition of the products of carbonization by exposure to red-hot coke and radiant heat. The conditions of the decomposition of toluene are under examination. Dr. S. F. Dufton, an honorary assistant, rendered valuable help in this research.

CORBET WOODALL SCHOLARSHIP.

Since the last annual meeting of the Institution, the first election has been made to the scholarship which was instituted by the late Sir Corbet Woodall. Mr. Leslie P. Ingram, the first Corbet-Woodall Scholar, is the son of Mr. Samuel J. Ingram, the Gas Engineer, of Truro. He entered on his course at the Leeds University at the beginning of the session 1916-17 in October, and will take his first examination in June, having been granted exemption from military service until July for the purpose. Mr. Ingram has already taken the intermediate B.Sc. Examination of the London University, and has in consequence been granted special permission by the University Court to shorten the Honours B.Sc. degree course to three years. Mr. Charles Wood, of Bradford, has been appointed to the vacancy on the Corbet Woodall Scholarship Advisory Committee caused by the death of Mr. J. G. Newbigging, of Manchester.

STANDARD SPECIFICATION FOR STREET LIGHTING.

A communication was received from the Institution of Electrical Engineers inquiring whether the Institution of Gas Engineers had any objection to the publication of a majority report of the Joint Committee on a Standard Specification for Street Lighting. After consideration, the Council agreed to this, provided a statement by the minority were published with the majority report, as follows:

The Council of the Institution of Gas Engineers at an early date expressed their opinion that the appraisement of street lighting in terms of minimum horizontal illumination obtained is not a correct method of measuring the illumination given by street-lamps, inasmuch as it is affected by the light given from other sources, of varying intensity, in different places, and at different times At a meeting of the Joint Committee held on Jan. 24, 1916, it was agreed to appoint a Sub-Committee to consider and report on a proposal to amend the specification so as to ensure a statement of both maximum and minimum horizontal illumination, with defined ratios. Such an amendment would have considerably modified and lessened the objection to the specification as previously drafted. It is regrettable that the Sub-Committee were unable to find a suitable form of words to bring forward, and that no such amendment is therefore to be included. The Council of the Institution of Gas Engineers formally express their opinion that contracts for street lighting should be based on the average candle power of light sources ascertained at two or three defined angles. This, in the opinion of the Council of the Institution of Gas Engineers, is the simplest and most correct method, and, moreover, would avoid the possibility of disputes arising from the more or less uncertain measurement of minimum horizontal foot-candle values.

The special thanks of the Institution are due to Mr. Robert Watson, of Doncaster, for having acted on their behalf in this matter, and for the considerable amount of work that he has done in it.

The complete specification appears in an appendix to the report. [See "JOURNAL" for April 22, 1913.]

COMMITTEE OF THE PRIVY COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

The Council of the Institution were asked by the Standing Committee on Engineering of the Advisory Council to assist in the scheme for the formation of panels in the various branches of the engineering industry, by nominating members for a panel relating to internal combustion engines. The names of the following members have been sent to the Council:

AUTOMOBILES—

Agricultural, Commercial, Pleasure Tractors.

Industrial.	Scientific.
F. W. Stevenson (Coventry).	A. E. Broadberry (Tottenham).

ENGINES—

Gas, Diesel, Oil, Petrol, Gas Turbines.

Industrial.	Scientific.
Dugald Clerk (London).	Captain H. Riall Sankey (London).
Charles Wood (Bradford).	Charles Carpenter (London).

FUELS—

Industrial.	Scientific.
George Helps (Nuneaton).	Prof. W. A. Bone (London).

GAS POWER—

Gas-Generators, Gas-Producers.

Industrial.	Scientific.
Samuel Glover (St. Helens).	Prof. J. W. Cobb (Leeds).
W. Doig Gibb (London).	Dr. H. G. Colman (London).

MAINS—

Industrial.	Scientific.
Walter Hole (Leeds).	Henry Woodall (London).

GAS-WORKS PLANT—

Industrial.	Scientific.
W. B. Leech (Leeds).	T. Goulden (London).
A. Wilson (Glasgow).	J. F. Bell (Derby).

INTERNATIONAL COMMISSION ON ILLUMINATION.

The National Illumination Committee of Great Britain, who are affiliated with this Commission, are constituted by co-operation of the Illuminating Engineering Society, the Institution of Electrical Engineers, the Institution of Gas Engineers, and the National Physical Laboratory. The Chairman is Mr. W. Duddell, F.R.S., Past-President of the Institution of Electrical Engineers; the Vice-Chairmen are Mr. John Bond, Past-President of the Institution of Gas Engineers, and Mr. A. P. Trotter, President of the Illuminating Engineering Society. The representatives of the Institution on this Committee are Messrs. Jacques Abady, John Bond, W. J. A. Butterfield, H. G. Colman, and R. Watson.

The Hon. Secretary and Treasurer (Mr. W. J. A. Butterfield) reports that the work of the Committee has been almost wholly in abeyance during the year 1916, owing to the partial severance of international relations, the claims of national service and war work on most of its members, and the absence of facilities for research caused by the depletion of laboratory staffs. The Committee held one formal meeting during the year. The Committee greatly regret the loss by death of one of the original members—Prof. Silvanus P. Thompson. The vacancy thereby created has not yet been filled.

NAPHTHALENE STOPPAGES.

Consideration was given to overcoming the difficulties which had arisen throughout the country in consequence of naphthalene stoppages. A Special Committee, consisting of the Emergency Committee and Dr. H. G. Colman, Mr. H. O. Carr, and Mr. G. M. Gill, were appointed to deal with the matter; and their work resulted in the speedy issue of a *brochure* to the gas engineer of every undertaking in the United Kingdom, pointing out how the difficulty of naphthalene stoppages could be overcome. [See "JOURNAL" for March 20 last, p. 554.] The voluntary and useful work of Dr. H. G. Colman and Mr. W. E. Price in drawing up the *brochure* must be specially referred to.

CANAL TRAFFIC.

The Waterways Association, in the work of which the Institution are interesting themselves, report that, with reference to the year 1916, the work has necessarily been of an educational character. While the war lasts, no constructional or reconstructional work can be expected or attempted. Their policy involves the acquisition of inland waterways by the State; their improvement, by widening both the waterways and locks to pass larger boats up to 100 tons, instead of the present 25-ton boat or train of boats; the reduction of the number of locks by substitution of lifts; and an improvement in the section of the canals by walling the sides, &c. All of this requires labour and material, quite unobtainable while hostilities last. The Association see, however, that the assumption of control by the Government, and a recent statement by Mr. Robertson in Parliament, point to action at the first opportunity—action warranted by the congested state of inland transport, and demanded by public opinion, which calls upon the Government to revive the method of transport upon which our commercial prosperity was built up in the early days of the last century, and by means of which our Continental competitors achieved theirs in its closing years. The Association point out that since 1840 there has been no development and no expenditure; so that to-day the capacity of our canals is less than in the middle of last century. Meanwhile, France, Belgium, and Germany have re-constructed theirs; so that the Royal Commission was able to say that on French canals rates of freight had fallen 50 p.ct. in fifty years.

BRITISH ASSOCIATION FUEL ECONOMY COMMITTEE.

Mr. Douglas H. Helps, of Reading, who has represented the Institution on this Committee, has made a report. The Council have passed a cordial vote of thanks to him for the great interest he has taken in the work, and for all that he has done in connection with it. Mr. Helps said:

I desire to express regret that Mr. A. E. Broadberry, who was appointed to represent the Institution of Gas Engineers on this Committee, had eventually to resign from it, owing to pressure of other work which arose after his appointment.

I was appointed in his place, and afterwards attended the meetings of the Fuel Economy Committee and of the Sub-Committee on the Carbonization of Coal, and on May 11, 1916, presented a report to the latter Committee on the questions of vertical and horizontal retorts, the disposal of gas-works coke, the use of gas for industrial purposes, and the direction in which progress is taking place in the gas industry.

In the appendix will be found a copy of a memorandum prepared by the Chairman of the Carbonization Committee (Mr. T. Y. Greener), describing the work of the Committee since their appointment. This memorandum was included as an appendix to the general report of the British Association Fuel Economy Committee presented at the meeting of the British Association in September last. [The memorandum is not reproduced here, as it was given in the "JOURNAL" for Sept. 12 last, p. 512.]

A Board of Fuel Research has now been appointed on the recommendation of the Advisory Council of the Committee of the Privy Council for Scientific and Industrial Research. This body, with Sir George Beilby, F.R.S., as Director, has taken over the work of the Fuel Economy Committee; and Prof. W. A. Bone, F.R.S., who is so well known in the gas industry, and who was Chairman of the Committee, has been appointed to act as consultant to the Board.

The Committee appointed by the British Association found there was a vast field for research; and there is no doubt that the work done by the Fuel Economy Committee will be of much value to the Board of Fuel Research.

ENGINEERING STANDARDS COMMITTEE.

The Engineering Standards Committee have decided to reorganize the work in connection with the Sectional Committee on Screw Threads and Limit Gauges, by extending the scope of their

labours. With this object, the Sectional Committee was dissolved and a new Sectional Committee appointed under the title of Sectional Committee on Machine Parts, their Gauging and Nomenclature. Mr. Alex. Wilson, of Glasgow, has been appointed to represent the Institution on this Committee.

Standard Conditions of Contract.

Attention has been given to the revision of the Standard Clauses of Contract. The Council were asked to consider proposals by the Society of British Gas Industries. As a result, revised clauses under the title of "Standard Conditions of Contract" have been published, which are obtainable from the Institution or the Society of British Gas Industries. [These clauses are given in an appendix to the report.]

National Insurance Act (Part II.) (Munition Workers).

Representatives of the Institution interviewed the Umpire with respect to the bearing of the Act on workpeople in the service of gas undertakings. The following decisions of the Umpire having reference to the gas industry are to hand from Mr. Alex. Wilson, of Glasgow, who continues to take an active interest in this subject.

Contributions are payable in respect of—

Workmen engaged in fitting up, finishing ready for sale, or repairing metal gas cooking apparatus, coal and coke stoves, ranges or grates, and gas-stoves, including men engaged in assembling, grinding, polishing, blacking, packing, and dispatching.

All classes of workmen employed in sheet, black plate, tin, and terne plate works.

Workmen employed in the manufacture or repair of gas-meters, including painting, testing, examining, packing, leather sewing.

Workmen employed at gas-works, or at gas bye-product works, and engaged wholly or mainly in the distillation of tar or in the extraction of light oils from tar or oil.

Workmen engaged in the recovery of tin, iron, or other metals from tin-plate scrap.

Workmen engaged in mixing and grinding mortar.

Gatemen, if employed wholly or mainly by way of manual labour—*e.g.*, in such works as opening and shutting gates, taking in and handing out checks, operating a weighing machine, keeping the yard tidy, carrying messages.

Contributions are not payable in respect of—

Workmen engaged in the manufacture of gas-mantles for sale in munition factories.

Charwomen engaged wholly or mainly in cleaning offices.

Workmen employed by a gas company and engaged wholly or mainly in the manufacture of carburetted water gas.

Gatemen when not employed wholly or mainly by way of manual labour—*e.g.*, in clerical work, watching persons passing in and out and noting times, examining passes, keeping records of traffic, &c.

Workmen employed as engine tenters or as stokers in connection with uninsured trades.

Persons employed wholly or mainly as draughtsmen, tracers, office attendants, office messengers, commissioners, clerks, typists.

Workmen described as rest-room attendants, and engaged in looking after workers, keeping rest-rooms clean, &c.

Summer Time Act, 1916.

The Home Office Committee appointed to inquire into the Social and Economic Results of the Summer Time Act, 1916, and to consider (i) whether it is advisable that Summer Time should be re-introduced in 1917 and in subsequent years, and, if so (ii) whether any modifications in the arrangements are required, and (iii) between what dates Summer Time should be made operative, asked the Institution for evidence as to the effects of the Act on the gas industry. Representatives of the Institution attended accordingly, and gave evidence before the Committee. The Act came into operation on April 8 last; and the time of the sun will be reverted to on Sept. 23. The Home Office have expressed their appreciation of the assistance which the Institution rendered in obtaining information on this important subject.

National Gas Council.

The special meeting of the Council, to consider the question of the organization of the gas industry, which was referred to in the last report of the Council, took place. Various conferences were held subsequently, with the result that on Oct. 3 last the National Gas Council was constituted. It is formed of the governing bodies of the Institution, the British Commercial Gas Association, the Society of British Gas Industries, and the Gas Companies' Protection Association. Mr. H. E. Jones was elected as first President, and Mr. D. Milne Watson as the first Chairman of the Executive Committee.

The Executive Committee consists of nine members of each of the four constituent bodies. The representatives of the Institution elected on the Committee consist of the Emergency Committee—*i.e.*, the President (Mr. A. E. Broadberry), two Vice-Presidents (Mr. S. Glover and Mr. T. Berridge), Hon. Secretary (Mr. W. E. Price), the three Hon. Councillors (Mr. John Young, Mr. John Bond, and Mr. R. G. Shadbolt), and Mr. W. Doig Gibb and Mr. H. Kendrick. The sum of £100 was voted by the Council as a subscription to the funds of the National Gas Council.

Coal Supplies.

At a recent meeting of the Council, a letter, which was addressed to the President by the Controller of Coal Mines, was considered; and it was resolved that every effort be made with the object of complying with the request contained in it.

[The letter, which drew attention to the importance of bringing under the notice of the gas industry the urgent necessity of restricting, as far as possible, the quantity of coal used for gas making, will be found in the "Journal" for the 15th inst., p. 281.]

Mr. Thomas Glover, of Norwich, Past-President of the Institution, has been appointed Technical Adviser to the Coal Controller.

Gas Oil.

A meeting was held on Oct. 2, under the auspices of the Institution, to consider a communication received from the Director of Munitions Overseas Transport asking for particulars of the quantity of petroleum gas or solar oil used monthly in the manufacture of carburetted water gas, and as to the possibility of reduction during the following winter; also as to what additional quantity of coal would be required to make up for any curtailment of the use of oil. A deputation on the matter was subsequently received by the Director, who informed them that he was satisfied that, speaking generally, the consumption of gas had already been voluntarily reduced by gas undertakings to the minimum, and that no further reduction in supply should be suffered if it were possible to avoid it. At the request of the Director, the Institution obtained, and supplied him with, a return from every undertaking manufacturing carburetted water gas, showing the respective storage capacity for gas oil at each works.

Gas (Standard of Calorific Power) Act, 1916.

The Council have given close attention to the provisions of this Act; and representations have been made to the Government on behalf of the Institution in regard to the conditions to be observed in applying for powers under the Act. They desire to point out that, under the Act, power is given to use any form of calorimeter that may be agreed upon by both parties.

Co-operative Tar Distilleries.

Proposals for the working of co-operative tar distilleries in connection with gas undertakings have received the consideration of the Council, and have been referred to the National Gas Council.

Sales of Gas Act, 1859.

The Parliamentary Committee have considered a movement instituted by the Newcastle-on-Tyne Corporation, with a view to the amendment of the Sales of Gas Act, 1859. The Committee referred it to the Joint Life of Gas-Meters Committee, who have directed a letter on the subject to be addressed to the Deputy Warden of the Standards, Board of Trade (Standards Department). The subject was under consideration in the year 1907, and is referred to in the Council's report that year. A recent communication from the Deputy Warden states that the Department see no prospect that they will be in a position to introduce legislation on the matter in the near future.

Wages Paid by Gas Undertakings.

The attention of the Council has been called to the desirability of obtaining particulars as to wages paid to the various classes of gas-works operatives throughout the country. After consideration, they recommended that each District Gas Association should arrange, through its Commercial Section, for the collection and tabulation of the desired information, on lines corresponding with the schedule drawn up by the Lancashire Commercial Section of the Manchester District Institution of Gas Engineers.

Building.

The Council recently had brought to their attention the pressing need of an effort being made towards the provision of a building in which the work of the Institution and kindred bodies could be adequately carried out. They unanimously decided that, in the interests of the industry, it is desirable that steps be now taken in that direction. They accordingly nominated, subject to their consent to serve, a Building Committee.

[The names of those nominated, together with the letter sent out by Mr. Dunn, were given in the "Journal" for the 15th inst., p. 280.]

A meeting was held on May 21, and was well attended and representative. The whole matter having been fully disussed, the following resolutions were passed:

(*a*) On the proposal of the President, seconded by Mr. Charles Hawksley, son of the late Mr. Thomas Hawksley, who was President from 1864 to 1867—

"That a Building Committee be formed, with a view to providing a suitable building for use as a central home for the Institution of Gas Engineers."

(*b*) On the proposal of Mr. Samuel Glover, Senior Vice-President, seconded by Mr. H. E. Jones, Past-President—

"That a Building Committee be formed, consisting of those whose names are contained in the list which was issued with the Institution's letter of May 11, 1917, with power to add to their number."

Council and Committee Meetings.

The Council have held five ordinary meetings and four special meetings during the past year. The Corbet Woodall Advisory

Committee have held one meeting; the Emergency Committee, ten meetings; the Finance Committee, six meetings; the Gas Lighting, Heating, and Ventilating Committee, four meetings; the Gas-Meters Research Committee, five meetings; the Naphthalene Troubles Committee, two meetings; the Parliamentary Committee, one meeting; the Publications Committee, one meeting; and the Refractory Materials Committee, three meetings. A number of deputations of the Council and Committees to various Government Departments, &c., have also been arranged during the year.

The report, which is dated May 22, is accompanied by the accounts, and is signed by the President (Mr. A. E. Broadberry) and the Secretary (Mr. Walter T. Dunn). In addition to the appendices already alluded to, there are lists of presentations to the library, and of those to whom Institution certificates for gas-fitters have been granted.

APPENDIX A.

BRITISH ASSOCIATION FUEL ECONOMY COMMITTEE.

REPORT BY MR. D. H. HELPS, REPRESENTATIVE OF THE INSTITUTION OF GAS ENGINEERS.

POINTS IN CONNECTION WITH GAS-WORKS PRACTICE.

In presenting this report, the writer desires to express regret that Mr. A. E. Broadberry had to resign his seat on the Committee, owing to pressure of other work which arose after his appointment.

The following is an extract from the minutes of a meeting of the Sub-Committee on the Carbonization of Coal, that was held at Leeds on Feb. 17, 1916:

That Mr. Broadberry should report upon the following points in connection with gas-works practice:

(*a*) The number of vertical and horizontal retorts in operation respectively, and the comparative merits of each.

(*b*) Statistics as to how gas-works coke is disposed of throughout the country, and how much of the gas produced is used for industrial purposes.

(*c*) The direction in which progress is taking place.

(I.) VERTICAL AND HORIZONTAL RETORTS.

No statistics as to the number of vertical and horizontal retorts in operation are available. The number in use alters with the season of the year; also the dimensions—particularly in the case of the horizontals—vary both in length and section.

Comparative Merits.

At the present time, if it is necessary for an engineer in charge of a gas-works to make extensions to his carbonizing plant he should consider the question from many points of view; and it is often most difficult for him to decide, even in the case of a works under his control, which system—vertical or horizontal—will produce gas at the lowest cost per 1000 c.ft. He has to consider, *inter alia*, the following:

Existing retort house or houses.
Ground space available.
Cost of labour.
Class of coal which, owing to local circumstances, is most easily and cheaply obtained.
Capital, repairs, and renewal costs of the two systems.

The engineer has also to decide whether the vertical or horizontal retort will give the greater number of heat units or sperm value per ton of coal carbonized; also which will consume the smaller amount of fuel in carbonizing the coal. The residuals produced have also to be considered.

If, therefore, the engineer in charge of any particular undertaking finds it difficult to decide which system to instal, it would, in view of the great improvements which have been made in both systems in recent years, be unwise at this stage to say definitely that one system is better than the other.

So far we have considered the subject generally; whereas from the point of view of this inquiry (fuel economy) it is assumed that only two questions need now be answered—firstly, which system produces the greater number of heat units per ton of coal carbonized, and, secondly, which requires the smaller expenditure of fuel (coke) for carbonizing. These are two important considerations for this Committee. Unfortunately, they are questions on which opinions differ; also they are not, as previously explained, the only points which have to be decided. This, however, may be said, that if it were possible to obtain information as to the production of gas and expenditure on fuel in the best type of horizontal and vertical retorts, each carbonizing the same coal, and if the calorific value of the gases produced were each reduced to a common denominator, the vertical retort would probably yield the larger quantity of gas from the coal, and require the smaller expenditure of fuel in the process.

Several comparisons of the results obtained have been given from time to time, and generally to the advantage of the vertical system; but in nearly all instances the comparison has been made with horizontal retorts not installed with all the latest improvements.

(II.) DISPOSAL OF GAS-WORKS COKE; GAS USED FOR INDUSTRIAL PURPOSES.

The coke produced for sale on gas-works is sold and used for various purposes; but no statistics are available for the whole country, as to the proportion consumed in different directions. It is used in oden fires, either alone or mixed with coal; for direct heating in closed stoves; and for providing hot water supplies to hospitals, offices, churches, schools, private houses, &c. It is largely employed in the manufacture of cement and the heating of greenhouses, for malting, and the manufacture of carburetted water gas; also in steam-boilers and or various other purposes. Some electric power stations have not used any other fuel for years, and are evaporating up to 9 lbs. of water per pound of coke consumed.

In connection with the use of coke for domestic purposes, it may be said that tests have shown its radiant efficiency in open fires to be considerably greater than that of coal used in the same way. Even so, it is probable that gas-works coke will not to any large extent supersede coal in open grates, even if it were made a penal offence to consume coal in that way; for in that event perhaps the alternative would, in most cases, be a gas-fire.

About 18,221,000 tons of coal were carbonized in gas-works in Great Britain in the year 1913. This produced for sale—after deducting the coke used on gas-works—about 8,655,000 tons of smokeless fuel (coke), the use of which must have borne its part in mitigating the smoke nuisance.

Reports are attached on the results obtained with steam-boilers which have been equipped with the London Coke Committee's apparatus for burning coke. About one hundred sets of boilers have been supplied with this apparatus, each set consuming from 300 to 600 tons of coke per annum.

Use of Gas for Industrial Purposes.

With regard to the use of gas for industrial purposes, it is not possible to subdivide the total consumption into gas used for lighting, heating, cooking, motive power, &c. Prof. Bone, however, in his lecture at the Royal Institution in February last, stated that: "During the year ended March 31, 1913, no less than 1,900,000,000 c.ft. of gas, or 21½ p.ct. of the total output in the Birmingham area, was used for industrial purposes."

Previous to the introduction of the incandescent gas-burner and the increased use of gas-fires and cooking-stoves, the bulk of the gas produced was used for lighting purposes. Quite the reverse is now the case; and many gas undertakings' peak-load now occurs in the middle of the day, instead of an hour or so after sunset.

(III.) DIRECTION IN WHICH PROGRESS IS TAKING PLACE.

There is no definite information as to the total amount of coal carbonized in gas-works in Great Britain. The latest Board of Trade return gives 10,118,399 tons as the quantity of coal carbonized by authorized gas undertakings other than those of local authorities for the year ended Dec. 31, 1913, and 6,853,325 tons by the undertakings belonging to local authorities in the twelve months ended March 31, 1914—a total of 16,971,724 tons carbonized by authorized gas undertakings. There are a number of gas-works not included in the Board of Trade returns; and it has been computed that they carbonize about 1¼ million tons per annum. Thus the total coal carbonized in Great Britain in the year would be about 18,221,000 tons.

The quantity of coal carbonized in the year 1913 was abnormal, and due, no doubt, to a smaller production of carburetted water gas following on an increase in the price of oil. Of course, the amount carbonized fluctuates. The Board of Trade returns for 1912-13 give the quantity used by statutory undertakings as 16,052,487 tons; and for the year 1911-12, 15,635,012 tons.

Great improvements have been made in the carbonizing of coal, and particularly during the last ten years. Compared with the results obtained twenty years ago, the production of gas has increased by about 2000 c. ft. per ton; and this, based on the coal carbonized in the year 1913-14—viz., 18,221,000 tons—is equal to a saving of at least 3,000,000 tons per year. With the further improvements which may be expected, and if Parliament will substitute in all cases a reasonable calorific standard instead of the candle power standard, it is probable that the production of gas will be increased by a further 500 c. ft., or more per ton at no distant date.*

It is most desirable in the interests of all concerned that a calorific standard should be substituted for the candle power standard. The days of monopolies in the supply of artificial light are past; and it is reasonable to suppose that the suppliers of gas will not be so unwise as to distribute a commodity which is not the best suited to the requirements of their customers, for if they did so they would cease to receive the support of the public.

While, on the one hand, the adoption of a definite calorific standard for the whole country would facilitate the manufacture of apparatus for the consumption of gas, on the other hand, owing to variations in the quality of the coals carbonized, it would not be advisable to fix a uniform standard.

In considering this question, Parliament should, to a large extent, be guided by this consideration—that what is best for the consumer is such a gas as will provide the greatest number of heat units for the sum expended.

From time to time there is evidence that the directors of some gas undertakings do not realize that it is now more desirable than ever to encourage young men to undertake the wide technical training which is necessary to make a thoroughly qualified gas engineer. If the entry of such men into the gas industry is not encouraged, progress will be retarded. To quote Prof. Arthur Smithells: "A liberal investment in science should be made."

One direction in which directors could help would be to subscribe their company's funds for the establishment of a works where new processes and plant could be tested and examined, or for gas companies to provide a fund to enable arrangements to be made with some existing undertaking for the erection and testing of new plant, &c.

Although much progress has been made in the manufacture of gas, the advance in the design and construction of apparatus for its more efficient combustion, and generally in the economical consumption of gas, has been still greater. The introduction of the incandescent

* This statement will probably be criticized in the technical journals and by individuals. Since the report was written, the difficulties of obtaining supplies of coal and oil have increased; and there is little doubt that, at any rate under the existing circumstances, it now is advisable—wherever blue water gas or lightly carburetted water gas can be made—to reduce the quantity of gas made per ton of coal carbonized. Even so, if the latter policy is adopted, the combined production of coal gas and water gas per ton of coal will be greatly in excess of the 500 c. ft. referred to in the report.

burner with its mantle has increased the lighting duty of a cubic foot of gas by at least 900 p.ct., when the low-pressure burner is used, and by some 2000 p.ct. in the case of high-pressure burners.

As regards gas-fires, their use is extending very rapidly, owing to their increased efficiency as heat radiators and ventilating agents. Further improvements may be looked for in the construction of gas-fires, and also in gas-heated cooking-stoves.

A considerable percentage of the gas consumed is now used for providing hot water for domestic use, and improvements are constantly being made in the apparatus required for this purpose.

In conclusion, it may be said that a vast amount of work is being done by gas undertakings in order to instruct the public how to consume gas in the most economical way.

APPENDIX B.

STREET LIGHTING SPECIFICATION.

In December, 1910, a Committee was appointed by the Institution of Electrical Engineers to prepare a draft standard specification for street lighting.* The Committee was subsequently enlarged by the addition of representatives of the Institution of Gas Engineers, the Institution of Municipal and County Engineers, and the Illuminating Engineering Society. After certain preliminary clauses had been agreed upon, selected London streets were classified by municipal surveyors serving on the Committee, and photometric measurements were taken in each of them. The results obtained were embodied in further clauses which appeared to be generally acceptable to all the members of the Committee, subject to the settlement of a fundamental difference of opinion between the gas engineers and the remaining members of the Committee as to the character of the illumination on which the specification should be based.

The opinion of the majority was that the proper basis is to call for "minimum horizontal illumination;" and this was incorporated in an interim draft for the consideration of the Councils concerned. Counter-proposals—that "candle-power" should be the basis—were received from the Institution of Gas Engineers; but the specification was substantially accepted by the Councils of the Institution of Municipal and County Engineers, of the Illuminating Engineering Society, and also by the electrical representatives on the Committee.

With the object of thoroughly ventilating the question, in the hope that some means might be found of reconciling the views of the majority with those of the minority, the specification was discussed at a general meeting of the Illuminating Engineering Society on April 15, 1913, in the form of a paper by Mr. A. P. Trotter containing the draft.† The views there expressed were considered at subsequent meetings of the Committee, when it became evident that the two bases proposed were irreconcilable, and that unanimous adhesion to either basis would be unobtainable.

Further efforts have been made to frame such a clause as would be acceptable to the minority, but without result; and as the matter has now been under consideration for nearly six years, it has been decided to publish the specification as it now stands as a majority report. It is hoped that it may be found useful when the methods of street lighting are reviewed after the war.

Statement by the Minority of the Committee.

The Council of the Institution of Gas Engineers at an early date expressed their opinion that the appraisement of street lighting in terms of the minimum horizontal illumination obtained is not a correct method of measuring the illumination given by street lamps, inasmuch as it is affected by the light given from other sources, of varying intensity in different places and at different times. At a meeting of the Joint Committee held on Jan. 24, 1916, it was agreed to appoint a Sub-Committee to consider and report on a proposal to amend the specification so as to ensure a statement of both maximum and minimum horizontal illumination with defined ratios. Such an amendment would have considerably modified and lessened the objection to the specification as previously drafted. It is regrettable that the Sub-Committee were unable to find a suitable form of words to bring forward, and that no such amendment is, therefore, to be included. The Council of the Institution of Gas Engineers formally express their opinion that contracts for street lighting should be based on the average candle-power of light sources ascertained at two or three defined angles. This, in the opinion of the Council of the Institution of Gas Engineers, is the simplest and most correct method, and, moreover, would avoid the possibility of disputes arising from the more or less uncertain measurement of minimum horizontal foot-candle values.

After setting out the standard clauses for inclusion in a specification for street lighting, as given in the "Journal" for April 22, 1913, pp. 253-54, there is given in the appendix a modification of the table appearing in the number of the "Journal" referred to, and which was originally calculated by Mr. Haydn T. Harrison to show the candle-power required to produce a minimum illumination of 0·01 foot-candle on a horizontal plane 3 ft. from the ground, midway between two lamps of a given height and distance apart, but recalculated by Mr. M. Wilson, of the Board of Trade, for a height of 3·28 ft. instead of 3 ft. 3 in.—thus approximating more closely to the metre. The difference in the result (less than one-half of 1 p.ct.) is, of course, inappreciable. The following is an example:

H = height of lamp, h = height of photometer, D = distance apart of the lamps, all in feet. Let H = 12, h = 3·28, D = 100. Then $(H - h)^2 + (D/2)^2 = 257604$. Since D/2 is 50, look out in a table of squares and cubes the square of a number rather larger than 5000, the nearest square to 25,760,400, and take its cube. This number is 5075; the square is 25,755,625; and the cube is 130,709,796,875, of which the first five figures are sufficient. But the fourth figure of the square is not an exact fit; and, by proportion, the cube is taken as 130,740. As two lamps contribute to produce 0·01 foot-candle, the cube is divided by 2 $(H - h) \times 100$. Then 130,740/1744 = 74·97, which is given in the table as 75. If the photometer is 3·25 ft. high, the candle-power is 74·72.

* See "Journal" for April 22, 1913, p. 253. † *Ibid*, April 22, 1913, pp. 250-54.

THE BENEVOLENT FUND.

In their report for the year 1916-17, the Committee of Management of the Benevolent Fund state that the income of the fund for the twelve months ended Dec. 31 last was £626. This was made up from subscriptions £254, donations £169, interest £96, refundment of income-tax £15, and from the special appeal £91. The income for the year (the fortieth of the fund) is the largest received since its establishment in 1876. The total investments of the fund at Dec. 31 amounted to £2872, taken at cost price. The number of cases which have been relieved during the forty years the fund has been in existence approaches one hundred. Each succeeding Committee of Management has carefully considered the circumstances of the applicants, and given the utmost assistance that the means at disposal would allow. At the present time there are fifteen old members, widows, and orphans receiving the benefits.

The donation of £100 which Mr. John Young kindly presented at the last annual meeting as a memorial to his wife was invested in 5 p. ct. Exchequer bonds, and was subsequently converted into 4½ p. ct. War Stock on the issue of that stock.

The Committee much regret to announce the death of Mr. J. L. Chapman, who had acted as Hon. Auditor since 1905. They place on record their appreciation of the assistance he rendered the fund in that capacity, and in other ways. In his place, they have nominated Mr. S. Y. Shoubridge, of Lower Sydenham.

From the list of contributors and donors, it would be seen that there are still a large number of members of the Institution who do not assist this beneficent branch of its work. The Committee would remind them that subscriptions of 5s. and upwards will be gratefully accepted. Now that the increase in the cost of living is of such serious moment, the Committee feel an effort should be made to supplement each grant with a war bonus. This can only be done if new subscribers are registered, and if present subscribers will increase their contributions. At a recent meeting of the Committee, the question of a war bonus was considered; but they reluctantly came to the conclusion that the limited income of the fund precluded any addition being made to the amounts of the existing grants. It should be pointed out that, apart from £169 received as donations, and therefore not a regular item of income, there is really a deficit on last year's accounts of £17.

Among the constant supporters of the fund who are lost through the inexorable hand of death, is Sir Corbet Woodall, who had acted as Trustee since 1908. His counsel and guidance were ever at the disposal of the Committee; and they deeply regret his loss. At a special meeting of the contributors, Mr. Harry E. Jones, another valued friend of the fund, was elected to the vacant position. The members of the Committee who retire in rotation are Mr. Daniel Irving, of Bristol, and Mr. Alex. Wilson, of Glasgow. The Committee nominate Mr. W. N. Westlake, of Exeter, and Mr. James M'Leod, of Greenock, for election in their places.

Comparison of Lights of Different Colours.

In the last budget of notes communicated from the United States Bureau of Standards for publication in the "Journal of the Franklin Institute" is one (in abstract) entitled "An 'Average Eye' for Heterochromatic Photometry and a Comparison of a Flicker and an Equality-of-Brightness Photometer." The authors—Messrs. E. C. Crittenden and F. K. Richtmyer—point out that the comparison of lights of different colours is supposed to be based on an "average normal eye." Their paper records an attempt to approximate the results of such an eye with typical colour differences by the use of a large number of observers. In particular, results obtained by a flicker photometer and by an equality-of-brightness photometer, with several degrees of colour difference, were compared. In terms of the Ives-Kingsbury test solutions, for which the proposed normal ratio of transmissions (with a 4 wpc. carbon lamp) was 1·00, the average of 114 observers gave a ratio of 0·99. By using these test solutions, results obtained on the flicker photometer by a small number of observers can be corrected so as to give normal values with a high degree of accuracy. On the average, equality-of-brightness measurements also vary in proportion to the test ratio; but erratic variations often overshadow these systematic differences. For sources having relatively high intensity in the blue, flicker values tend to fall below those obtained on the usual standard photometers; but the difference is comparable in magnitude with the uncertainty of the latter values.

A Tar Varnish for Ironwork.—The following prescription has been published for tar varnish for preserving ironwork: Heat about 100 gallons of tar to a low boiling-point, and add 100 lbs. of fresh slaked lime sifted over the top and then worked down. Boil this mixture until it becomes pasty. Let it settle for a few minutes, and then add 20 lbs. of tallow and 5 lbs. of powdered resin. Stir until thoroughly mixed and all ingredients dissolved, then allow to cool. The mixture should not be raised to a higher temperature than 100° Fahr. Should the preparation be too thick, it can be thinned down with paraffin or naphtha. Gasholders and galvanized iron roofs and galvanized sides of buildings may be painted with two coats of this tar varnish, and then whitewashed over, which thoroughly protects them from the weather and salt air.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Quarterly Meeting.

THE One-Hundred-and-Seventy-Eighth Quarterly Meeting of the Institution was held last Friday, at the Grand Hotel, Manchester; and, judging by the exceptionally large attendance of members, the experiment of having the gathering on the Friday (instead of the Saturday, as heretofore) was a great success, though the proceedings were of a semi-private character.

The PRESIDENT (Mr. Walter Whatmough, of Heywood) occupied the chair.

MINUTES OF THE LAST MEETING.

The HON. SECRETARY (Mr. G. S. Frith, of Runcorn) having read the minutes of the last meeting, they were confirmed.

CORRESPONDENCE AND ACKNOWLEDGMENTS.

The HON. SECRETARY read a number of letters apologizing for inability to attend. He also stated that a warm letter of thanks had been received from the National Council of the Y.M.C.A. for the Institution's donation of ten guineas towards their war-work efforts.

NEW MEMBERS.

The following new members were elected: Mr. E. A. Buckley, Engineer and Manager, Holmfirth; Mr. F. E. Ward, Works Superintendent, St. Helens; Mr. C. W. Ward, Assoc.M.Inst.C.E., Works Manager, Blackburn; Mr. J. H. Noble, Engineer and Works Manager, Chester; Mr. Harold Higham, Engineer and Manager, Shipley.

THE PRESIDENT ON ACUTE PROBLEMS.

The PRESIDENT said they had now come to the most important part of their programme, and that was the consideration of the questions of (*a*) Labour difficulties due to the demand for all eligible men for the Army and National Service; and (*b*) Coal supplies. The fact that they were met together on a Friday was rather exceptional; but the Committee wished to see whether it better suited the convenience of the members. Another "departure" was that, instead of the usual "set" papers for discussion being circulated to members before the meeting, they thought, in view of the urgent importance of the subjects, there should be a change, though the reports of the proceedings would, in the national interest, be somewhat curtailed. The labour question was, as they all knew, a very acute problem; and there was every indication that next winter it would be even more acute than in the past. It was very important, therefore, that it should be taken in hand, in order to make provision to meet the demands of the public during the coming winter. He had much pleasure in calling upon Mr. Meunier to introduce the subject of labour difficulties.

SHORTAGE OF LABOUR AND GAS-WORKS DIFFICULTIES.

Mr. MEUNIER said he was sorry that a number of business engagements during the week had rather prevented him from going so deeply into the question of the labour difficulty as he would have liked. Consequently, his remarks would be rather brief. The problem of labour troubles and difficulties in connection with gas undertakings had developed enormously since the commencement of the war. During the past winter, they had felt the pinch to such an extent that the possibility of a recurrence during the forthcoming winter—the fourth winter—with all its difficulties and trials, was considered of such importance that the Committee thought it would be desirable to obtain the opinions of the members.

He might, perhaps, be allowed to follow, very shortly, the question from the start of the war. As they were all aware, the war came upon the country very unexpectedly; and immediately it was found necessary to ask all fit and eligible men to join-up. He thought that of all the industries which responded so nobly to the call, none replied more willingly, more freely, or more quickly than the gas industry. ["Hear, hear."] In fact, not only were the men willing to serve their country in its hour of trial, but they were given every encouragement to do so by gas committees and gas directors. As they were well aware, in many cases gas committees and directors went to the length of assisting the men's dependants. For example, his own town of Stockport was only indicative of what had been done everywhere; and at the present time the Gas Committee were paying out something like £2000 per annum. The men who went at first were certainly among the pick of gas-works employees; and though perhaps during the winter of 1914 they did not experience so much difficulty in keeping their concerns going, yet when the spring of 1915 came along, and they were asked to spare more men, these men were very willingly allowed to go. The consequence was that in the winter of 1915 they began to feel the pinch; and those who had not the benefit of carburetted water-gas plant undoubtedly felt it rather acutely. In fact, those who had carburetted water-gas plant only struggled through with a great deal of difficulty. This went on until last winter; and, as they knew, it was then that the labour difficulty was accentuated, and very deeply felt. In addition to this, the calls upon gas undertakings to supply certain products for war purposes had helped to materially increase their troubles.

After alluding to the calls upon the industry to release men for railway and road-making purposes in France, and to the splendid response to this appeal, Mr. Meunier said that this was followed by the call for men for National Service; and here, again, some of their indispensable men, in their patriotic feeling, had "signed on." These men had been called up from time to time. Fortunately, however, at Stockport, he had been able to show the authorities such perfect justification for their action in declining to release them, that he had been allowed to retain them. To-day there was the call for men over 41 years of age to offer themselves for enlistment. Up to 41, they might, perhaps, have managed; but if men over 41 were to be taken, he confessed it was very difficult to see how gas undertakings were going to carry out their national obligations. An example of what his experience had been at Stockport would, perhaps, serve to illustrate his point. During the past winter, they had only been able to keep going by the assistance of their carburetted water-gas plant. The effect of this had been, roughly, that they had to make nearly 152 million cubic feet of water gas out of a total of 834 millions sold. This represented a consumption of coke alone of 5516 tons. In addition, basing his conclusions upon their average make per ton of coal gas, they had less coke to put upon the market at the time when very heavy demands were being made for it for Government purposes and for munition works. Besides this, he estimated that there was a further loss of about 6550 tons of coke by having to use the carburetted water-gas plant, instead of other carbonizing methods. The two combined, therefore, made a total loss of about 12,000 tons of coke.

Mr. SAMUEL GLOVER (St. Helens): Is that in addition to the 5516 tons?

Mr. MEUNIER: We used 5516 tons in making carburetted water gas. There was another 6000 tons not made, because we had to go on carburetted water gas. We wanted, at least, another twenty men whom we could not get. Continuing, he said that, following on the question of coke, came the highly important point of tar, from which tar distillers and others were extracting certain materials for national work. The amount of carburetted water gas made at Stockport represented a loss of nearly 1000 tons of tar (the tar was not available for the market), and about 1200 tons of ammoniacal liquor—a dead loss, not only to their own revenue (which he did not wish to say much about, because they all had to "do their bit"), but to the country itself. It was from this standpoint he asked them to consider the question he had introduced, as he was afraid, if they were not to have the assistance of the requisite number of men to carry out their obligations, next winter their position would be considerably worse than it had yet been. In fact, the outlook was, to his mind, so black that he was afraid it might even go to the extent of reducing their output of gas, and so lower the production of shells. Government action should, he thought, be taken in time, and in such a way that this sort of thing should not be liable to occur—especially at a time like this, when they were doing everything they possibly could (perhaps better than any other industry) to supply the needs of the moment. No steps which could possibly be taken should be left untried, in order to impress upon the representative departments of the Government that they should move in the direction they wished.

COAL SAVING AND BLUE WATER GAS.

There was another point they would hear something about in the course of the afternoon, and that was the question of saving coal and replacing it by blue water gas. He did not propose to say very much in connection with this matter, other than to draw their attention to the fact—and he hoped through them to the National Gas Council—that such a step was a retrograde one. Undoubtedly, it might fill up a want, and it might have the desired effect in one direction—that of saving coal. But he ventured to think it was a step in the wrong direction. He was quite aware of the necessity of saving coal, and of the heavy demand for additional men from the coal-pits; but he ventured to suggest that the withdrawal of labour from essential industries for some sections of army and national service work was not of the same importance as finding the material with which munitions could be produced. From this standpoint, therefore, he ventured to state strongly that any step which was going to interfere with their output of straight coal gas would mean a very heavy loss in most important ways, unless, of course—and possibly this might be so—the Government departments that had the matter in hand had another solution to offer them. It might, perhaps, be that the Government departments were so well supplied with toluol and "T.N.T." that the necessity of labour for the output of gas was not so strong as he had anticipated. In this connection, he thought it would assist them—as manufacturers of these commodities—if they were given a lead, to show where certain of their services were not so essential as in other directions. If this were done, he was sure that, as loyal subjects, they would at once fall into line, and do everything the Government suggested. He thought they ought to express their opinions in such a way that they could be brought before the Government, and with no unfaltering voice ["Hear, hear"], because, if the authorities would not, or could not, take them into their confidence, members should at any rate take the authorities into theirs, and draw their attention to the difficulties which had arisen, and the reasons for so pressing the matter. If they could succeed in doing this, they would not only have had the courage of their convictions, but would have the feeling that they had done their utmost to forward the interests of the Empire, and, above all, to crush their opponents.

THE RESOLUTION.

With this view, therefore, he would like to suggest that the following resolution should be passed by the meeting:

That this meeting earnestly requests the National Gas Council to strongly impress upon the responsible Department of the Government the urgent necessity of affording the requisite assistance to gas undertakings to enable them to fulfil their national obligations in regard to output of gas, coke, and materials for explosives, by providing a sufficiency of labour, especially in the carbonizing department, and, if necessary, by supplying such departments with the following information—viz.:

Maximum daily winter demand for gas.
Maximum coal-gas plant available.
Maximum carburetted water-gas plant available.
Maximum number of men needed for such output.

The President said that, after the able opening of the discussion by Mr. Meunier, he thought they would all be pretty well convinced that the questions of labour and coal supplies intermingled with each other; and he suggested that they should continue the discussion on the two subjects conjointly. The Committee had also invited Mr. Thomas Glover, of Norwich, to attend the proceedings, and to take part in the discussion. He felt sure he was only voicing the opinion of the members in congratulating Mr. Glover upon his appointment as Advisory Expert to the Coal Controller; and they trusted that in these strenuous times he might have health and strength to execute these duties to his own satisfaction. He had not the slightest doubt Mr. Glover's appointment was to the advantage of the industry. To put the matter in order, he would formally second the resolution proposed by Mr. Meunier.

Coal Supplies—Board of Trade Assurance.

Mr. Samuel Glover said he was in the position of being a victim to his enthusiasm for the honour and dignity of the gas engineers of Great Britain, because he asserted at a meeting, when he was asked to deal with the subject, that the gas engineers of the country would insist upon, and would get, the coals that they required for their needs next season. He expressed his belief that this would be so; and he was prepared to renew it to-day. But this was about all he was in a position to do. He had come there with no panacea for all the ills that the Manchester gas engineering flesh was suffering from at the present time; but he was prepared to say that already many of the difficulties that began to frighten them when they looked upon the horizon at first, when the gas undertakings were brought under Government control, had disappeared. For instance, there was the regulation forbidding them to purchase more than three months' requirements at a time. This bogey had been removed, and many of them had, he hoped, purchased at last season's prices, if not less [Laughter], for next season's requirements, subject to the Controller. He did not see that the difficulties were made very much greater for many of them. He had expressed his faith and belief that there would be less disturbance in the purchase of their coals than many of them believed; and he took the opportunity of re-stating this faith that afternoon. In this connection, he had a letter from the Board of Trade, couched in the following terms:

> You may rest assured that gas companies, as public-utility undertakings, will have to be kept going, and that they will stand well up on the list of priority. It is fully realized at this end that fuel for the manufacture of gas is an economical way of treating a valuable commodity; and the industry is, therefore, to be encouraged as far as possible.

Renew Contracts at Once.

Continuing, Mr. Glover said that if every gas engineer was purchasing his coal he was going on in the right direction; and he hoped they had been able to renew their contracts, or were renewing them. He sincerely hoped no serious result would ensue as a result of the mistaken order about "three months'" supplies for gas undertakings. It was, he assured them, the first desire, and the intention, of Government Departments that they should renew them at once. Gas undertakings had at last received some recognition of the important position they held in the supply of products for the Nation and for their Allies. Things were not being done, he assured them, so badly behind their backs as heretofore; and the extract from the letter from the Board of Trade which he had just read showed they recognized that it was important adequate supplies of coal should be provided for the gas undertakings of the country. While he said this, he did not wish them to carry away the impression that they would always get the same coal, or the same quality of coal, which they had been in the habit of contracting for. There were all sorts of questions which would come along. In fact, already some of the difficulties which had since arisen had been mentioned to the Department, and suggestions made which had been acted upon. To illustrate his point, he read the following extract from another letter from the Board of Trade.

> With reference to the question of coal to be delivered by canal, . . . we quite appreciate the point you raise, and will see that steps are taken accordingly, . . . and would be glad if you would bring under notice any difficulty which may come up again in this particular or any phase of the subject.

These, said Mr. Glover, were the encouraging phases of the subject that he wanted to repeat, and, if necessary, to enlarge upon. He thought that coal supplies would be provided in the measure deemed most desirable in the interests of the nation in regard to raw coal. With regard to Mr. Meunier's reference to the loss of 12,000 tons of coke, he (Mr. Meunier) refrained from taking credit for the fact that he had, by his action in ridding the trade of the coke, saved more than 12,000 tons of raw coal, which was still there, and had not been destroyed. It was there for another day—a better day. In regard to the question of purchasing coal from fields other than heretofore, the intention, and the desire, of the Coal Controller was to prevent coals from one area going to another area where a supply was already available. He suggested to his audience that if coals were prevented from going into one market, they were still to be had in another market—and that might be found more near their home! The law of supply and demand would come along, and merchants would not be able to stock coal for fancy prices if they had it unsold on account of the restriction of transport facilities. "I do think," the speaker concluded, "coals will be provided; and the conveyance will be there." [Applause.]

[Owing to failure in the postal arrangements, we are unfortunately unable to complete our report of the proceedings at the meeting in this issue of the "Journal," with which (consequent on the Whitsuntide Holidays) it was necessary to go to press on Saturday, rather than Monday as usual.—Ed. G.J.]

At the meeting in London on the 15th prox. of the Institution of Mining Engineers, Dr. J. S. Haldane, F.R.S., will read a paper on the "Spontaneous Firing of Coal," and Mr. Ernest Bury one on the "Bye-Product Coking Process."

SIXTY YEARS AGO.

From the "Journal" for May, 1857.

A Flintoff Company.—We publish an instructive document in the shape of the balance-sheet of the twenty-six months' operations of the Sheffield Consumers' Gas Company, a speculation in which Mr. Flintoff induced the Sheffield public to embark and incur obligations exceeding £50,000 in amount. This document proves that the sale of about 14½ million cubic feet of gas at 3s. and 18½ million feet at 4s. per 1000 c.ft., resulted in an average loss of nearly 11½d. per 1000 c.ft., exclusive of interest on capital; and this, too, in a coal-producing county, and in a position where the best gas coals can be delivered into the works at 9s. per ton. This peripatetic individual has recently located himself in Dublin, and has there issued a statement, in which he attempts to prove that the citizens of the Sister Metropolis may be supplied with gas at 3s. 3½d. per 1000 c.ft., with a profit of 10 p.ct. upon the capital employed; the price of coals being assumed to be 17s. 6d. per ton. It remains to be seen whether the gas consumers of Dublin will profit by the experience of their brethren in Sheffield; and we recommend them to examine how far Mr. Flintoff's theoretical estimates have been verified by the test of experience, before they commit themselves to any experiment of their own. We may add that the loss at Sheffield was really greater than is shown by the accounts, as during the six months preceding the handing over of the works to the old Company no repairs of any importance had been executed; and in the final settlement, a large sum was charged to the Consumers' Company on this head.

Vegetation near Gas-Works.—The attention of the Committee of the Metropolitan Medical Officers of Health has been directed to the question of the nuisances arising from gas-works; and their report is published. A more meagre and worthless document it is scarcely possible to conceive; and the inquiry naturally suggests itself, why the Officers of Health have neglected to ascertain and make known the statistics of the health of the numerous body of labourers employed in this reported-to-be insalubrious manufacture. Surely, this ought to have constituted one of the elements of such an inquiry; and we happen to know that the managers of several of the works visited have insisted upon some evidence of this description being taken by the self-constituted Committee of Medical Officers. Why has all reference to this branch of the subject been suppressed? Do the replies confirm or contradict the theory of the noseologists that the exhalations from gas-works are insalubrious and injurious to health? Well-established facts on this head are worth volumes of speculative opinions; and we cannot help feeling that the omission of all allusion to the question has been intentional on the part of the Committee. While upon this subject, we may as well mention that we receive almost daily communications negativing the evidence given for the plaintiff in the Broadbent case, with respect to the injurious effect of gas-works upon vegetable life. Mr. George Hedley, of the Dorchester works, sends us some extraordinarily fine specimens of asparagus, grown in beds within 30 feet of his retort and purifying houses—one of the heads measuring no less than 8 in. in length by 3 in. in circumference, and weighing 2¾ oz. Peas, strawberries, potatoes, and apple-trees present equally promising appearances; and bouquets may be cut which Covent Garden could scarcely rival.

Gas for Calibrating Optical Pyrometers.

A gas-furnace utilizing the surface combustion principle, and so designed as to obtain the temperature of 3000° Fahr., which is sufficient for much of the work of calibrating optical pyrometers, is described in the "American Gas Engineering Journal" by Mr. H. L. Read, of the Surface Combustion Company, Long Island City. The furnace is cylindrical in shape; and the impact burner is used without the refractory bed. The necessary baffling of the mixture, in order to reduce its velocity after it leaves the burner, is secured by friction against the circular walls. Entering the burners from the proportioning inspirator, the mixture passes from the nozzles and scrubs along the walls of the furnace, which are protected by a layer of alundum cement. After some whirling round, the gases leave the furnace through a hole in the centre of the front, through which opening, also, the pyrometer to be checked is sighted. A block of carborundum is placed in the middle of the back wall; and against this the pyrometer is aimed. With this furnace a temperature of 3000° Fahr. was reached in 1 hr. 20 min., with a total consumption of 420 c.ft. of 650 B.Th.U. gas; and it is possible to maintain this heat with a consumption of about 275 c.ft. per hour. Another suggested use for such a furnace is for the determination of the fusing-point of coal ash—a matter of importance, inasmuch as the higher the melting-point of the ash, the less the formation of clinkers.

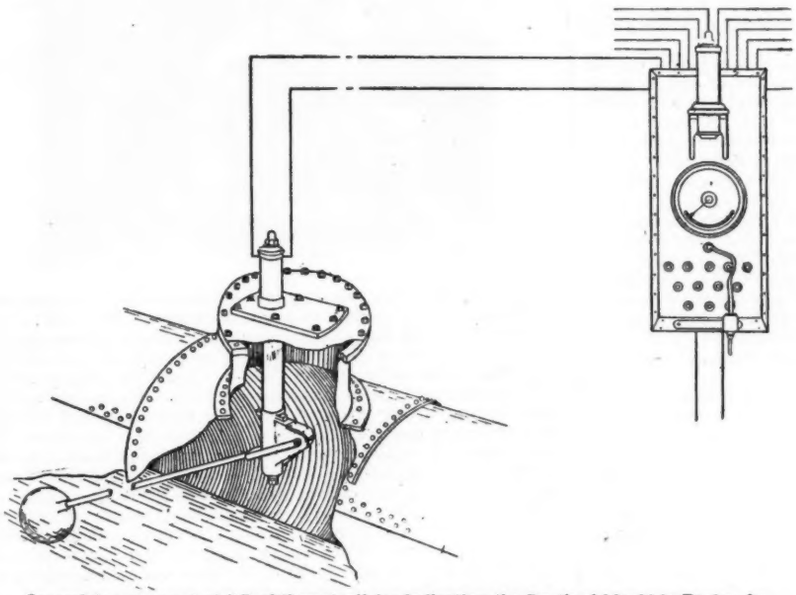
Gas from Peat.—Practical means for overcoming the difficulties in the use of peat in gas-making continue to be discussed in France. M. Laurain recently at the Société Technique du Gaz quoted figures for the carbonic oxide produced in peat gas to a proportion as large in some cases as 22 p.ct. Purification with lime is now a very costly process. A chief requirement in present circumstances is the discovery of other means for removing the carbon dioxide.

APPARATUS FOR INDICATING THE DEPTH OF LIQUIDS IN TANKS.

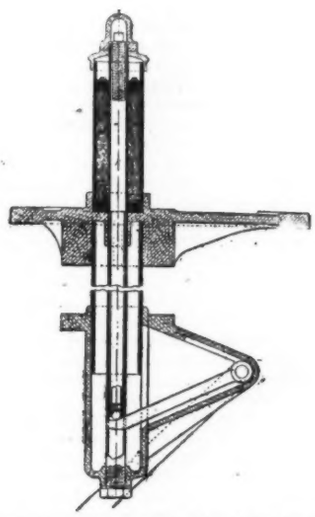
[From the Iron and Coal Trades Review, May 18.]

In these days, when the bye-product plants and the chemical works throughout the kingdom are being pushed to the full limit of their capacity, labour-saving apparatus which at the same time negatives possibility of error due to the human element, deserves the serious consideration of the interests affected.

It may be conceded that there is need for an appliance for indicating or recording the depth of liquids in storage and other tanks. Frequently, such tanks are scattered over a wide area; and from necessity they are in positions which are not readily accessible—often also at considerable heights from the ground level. In such circumstances, difficulty is experienced in ascertaining the depth of their contents, or in regulating the flow of the liquid. During inclement weather the requisite attention is either omitted entirely or neglected; and it must not be overlooked that the very position of these tanks adds to the element of danger in their manual operation. Some provision for enabling the operator to determine the contents of the tanks is, therefore, a necessity. Obviously such apparatus must be reliable, or the remedy may well prove worse than the disease. It follows also that it must be perfectly safe when used on tanks containing gaseous and inflammable liquids—such as benzol, toluol, &c. To serve its proper function, it should be capable of indicating the depth in a continuous curve from "empty" to "full;" while, finally, it must combine simplicity with a maintained efficiency, and at the same time require a minimum of attention.



General Arrangement of "Dephthometer" for Indicating the Depth of Liquid in Tanks, &c.



Section of "Dephthometer," Showing Details of Construction.

On a recent visit to a bye-product works in the North, our representative saw in operation an apparatus which appears to fulfil satisfactorily the requirements referred to above.

The apparatus is operated electrically by a low-voltage alternating current; the supply being taken from the power mains and transformed down to 20 volts. But, obviously, the voltage will to some extent depend upon the length and disposition of the wires. In the installation under notice, the instrument is operating perfectly in connection with a tank distant a mile-and-a-half. The principles applied in the operation of the system, and the adoption of alternating current, make it practical to dispense with moving contacts; so that sparking and oxidation troubles are entirely eliminated.

On almost all alternating current systems there is an amount of fluctuation in the pressure of supply which, if not provided for, would be fatal to the accuracy of the readings of the instrument. The necessary correction, however, is adequately dealt with in the apparatus under review in a manner to be described later, so that an absolutely correct reading is obtained.

The apparatus consists essentially of a solenoid with an iron core which is operated by a float, and an ammeter calibrated to read in feet and inches, arranged in series-circuit on the supply; the applied principle being that a solenoid having a movable iron core and carrying an alternating current in its windings offers a reactance or obstruction to the passage of the current in direct proportion to the length of iron inserted.

Referring to the illustrations it will be seen that the whole of the current-carrying parts are contained in a solid brass tube hermetically sealed from contact with any tank vapours. This tube is brazed into the lower member, and is also brazed into a brass flange which is machined on its seating so as to make an air-tight joint on the tank. The inductive winding is placed above the flange, and is also in a gas-tight case. Suitable means are provided for adjusting the core, through the medium of a screw and nut. In cases where only one instrument is employed for measuring a number of tanks, the core is made in two parts, an upper and a lower—both being provided with means of adjustment, for calibration purposes. It may be further noted that the float arm makes contact with the core through the medium of a ball working in a free race, and is provided with efficient lubrication for ensuring smooth and easy action.

The recording instrument is shown with the pressure regulator mounted above it. The regulator consists of an auto-transformer specially wound and connected and provided with a magnetically floating core which has a taper end, and is so tuned as to float in the best inductive position in the lower (the secondary) winding. When the conditions of the supply circuit require it, an attachment is provided for dealing with what might be termed the "hunting" of the regulator core. Depending from the taper end of the core is a non-magnetic rod, provided at its extremity with a disc—the rod and the disc forming a piston which works in an air dashpot, and serves to damp the oscillation, and, as the dashpot is of glass, also to indicate the position of the core.

As the apparatus is mounted vertically, the core (in operation) induces more or less lines of force in the secondary winding, according to the pull of the primary winding, which latter is determined by the intensity of the impressed voltage. The pull on the core is balanced against the force of gravity, so that a drop in the impressed voltage allows the core to fall, and by inserting more iron in the secondary winding increases the pressure from the terminals of the latter.

The secondary winding is connected in shunt across the terminals of the indicating instrument, and the current from the secondary of the pressure regulator is thereby superimposed on the main circuit, so that any variation of supply pressure set up by fluctuations is counterbalanced in the instrument circuit.

Evidence as to the efficiency of the regulation was furnished by watching the instrument for a few minutes; for while the core showed, at times, a considerable amount of movement (thus proving the variation in supply pressure), the pointer of the recording instrument remained stationary.

As previously mentioned, one instrument may be employed to ascertain the depth of liquid in any number of tanks; and in the first illustration the arrangement is shown under construction for installation in the works visited by our representative. This instrument is designed for use in connection with fourteen tanks, disposed over five or six acres, and at heights above the ground-level varying from 40 ft. to 65 ft. When it is remembered that the depths in many of these tanks have to be taken every half-hour, the saving in labour which will result from the installation of a system whereby the records can be taken in the central office, will be appreciated. In many instances it would no doubt be found conducive to efficiency of working to instal, side-by-side, separate instruments for each tank, when there would, of course, be a continuous reading, as opposed to the periodical readings possible when the plug-board is employed.

It may be noted that the design of the instrument renders it equally efficient for use on tanks under pressure; and while the duties referred to are for the moment all important, the instrument may well find other fields of usefulness.

COAL GAS A SUBSTITUTE FOR PETROL ON COMMERCIAL MOTORS.

By W. Clark Jackson, of Neath.

[A Paper read before the Wales and Monmouthshire District Institution of Gas Engineers, May 16.]

There is at present great interest being taken in this country in the possibilities attached to the use of coal gas for road traction purposes; and as the development of this is likely to open-up a very large avenue of consumption for practically every gas undertaking in the country, it is essential that gas engineers and managers should give the subject their serious attention, and keep in touch with the movement as it advances step by step. That coal gas could be used in petrol motors has been well known for many years, as practically the whole of the makers of motor-car engines have used coal gas for partly "running-in" their engines, preparatory to putting them under full-load test with petrol. Unfortunately little, if any, effort was made by these firms to ascertain the ratio of maximum horse power when running with coal gas to maximum horse power when running with petrol; there having been no real need in their case for carrying out the necessary tests.

Since the proposed substitution of coal gas for petrol has come forward as being a practicable issue, these figures have been gone into; and from tests at Guildford, the results show that with petrol engines running on coal gas the engines give a ratio of power of from 84·4 to 87·9 p.ct. to the power on petrol. No alteration whatever was made to the engine design during the tests. There is no doubt that with engines designed for a higher compression the power ratio would compare even more closely with petrol, though these figures show a very small loss of power when running with gas in place of petrol.

For all practical purposes we may reckon that petrol can be looked upon as hexane (C_6H_{14}), as it is a mixture of this with the lower and next highest members of the group in proportions which give about this composition. The thermal value of petrol (sp.gr. ·684) is 20,923 B.Th.U. per pound. Commercial petrol is never equal to this quality; being found to approximate more round about ·72 sp.gr.—a quality yielding approximately 19,000 B.Th.U. per pound, although even this is a rather high figure. The coal gas equivalent, therefore, of a gallon of ordinary commercial petrol, taking coal gas of 500 B.Th.U. per cubic foot, would be 273 c.ft. On the basis of an 84 p.ct. engine efficiency, using coal gas, the comparative figure is 325 c.ft. of gas; or it can be taken for granted that 1000 c.ft. of gas is rather more than the equal of 3 gallons of petrol. From these figures it will be seen that at the present price of 2s. 2d. per gallon for petrol, coal gas, at the usual present-day selling price of 2s. 6d. to 5s. per 1000 c.ft., will work out considerably cheaper than petrol.

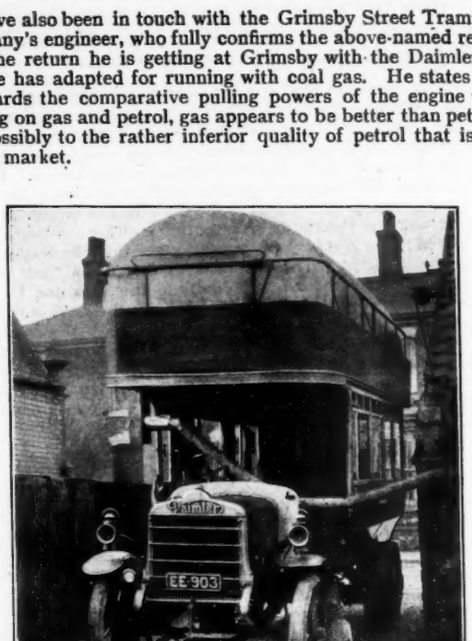
Another factor which is at present bringing the question of coal gas very much to the fore for this purpose is the shortage of petrol generally in this country, and the accompanying difficulty in getting a requisite amount for commercial purposes. Judging from the Government restrictions, this is not likely to get any easier for some considerable time, and owners are faced with the necessity of either providing themselves with some petrol fuel substitute or else having their cars lying idle. The different petrol substitutes which having been placed upon the market recently are also likely to come under the Government restriction ban; and the field is thereby being opened-up for gas, as in a great many cases business firms would be badly crippled if their service cars had to be laid-up.

Taking for granted coal gas fuel can be used as a substitute for petrol, and that for this purpose power for power it works out cheaper than petrol, the first problem that arises is the one of storage. Petrol is extremely easy to store, and can be carried in such quantities as to run almost any length of trip. With gas, however, the storage question is much more difficult, as sufficient gas must be stored to enable the service car or bus to run a reasonable number of miles without having to resort to refueling. And this quantity must be stored in a receptacle of such a character and design as will not superimpose any great additional weight on the vehicle, and will at the same time take up the least possible amount of space. These two factors are very important; and as with service cars the maximum carrying space is very essential, as the addition of a ton of dead-weight to any 3-ton to 5-ton motor vehicle will mean an additional running cost of, approximately, 1d. per mile. It is essential, therefore, that the full importance of these two factors be really appreciated.

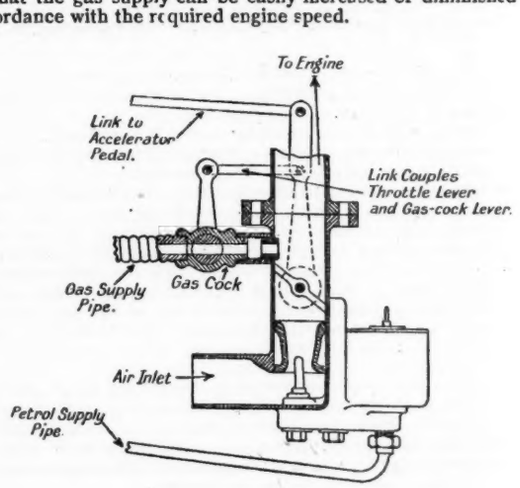
Running Experiences with Buses.

The problem as applied to motor buses has been very ably tackled by a Beeston firm, who have for some considerable time been running a service of motor buses using coal gas as the motor power. Through their courtesy, I am able to give the results of their experience, gained over a period of nine months' running; and it shows very conclusively that coal gas can be used most successfully for this purpose. They state that coal gas has been in daily use for over nine months as the motor fuel for their public service motors with every success, doing the work better, and being more reliable than petrol. The gas is carried in a flexible collapsible holder or gas bag on the top of the bus—this being strapped firmly to the roof. They state that, with proper adjustment, they get practically the same power out of their engines as when running with petrol. Their vehicles at busy times carry over seventy passengers; and as the buses themselves weigh over 3½ tons dead-weight, the car load at times is as high as 9 tons. The gas consumption under these conditions averages 350 c. ft. per 12-mile run, with average drivers in charge; but with special care an average car load of 7 tons has been run 18 miles with a consumption of only 370 c.ft. These figures show very conclusively that gas is a paying investment on their buses as compared with petrol.

I have also been in touch with the Grimsby Street Tramways Company's engineer, who fully confirms the above-named results with the return he is getting at Grimsby with the Daimler bus that he has adapted for running with coal gas. He states that, as regards the comparative pulling powers of the engine when running on gas and petrol, gas appears to be better than petrol—due possibly to the rather inferior quality of petrol that is now on the market.



The accompanying photograph shows clearly the operation of recharging the holder with gas at the end of a run. The cost of converting these buses for using coal gas is very reasonable, as a holder or gas bag capable of storing 400 c.ft. of gas, works out at something under £20—this being the principal item. The gas connections to the engine are very simple, and can be made by practically any plumber. The bag consists of a simple sack of canvas, covered with rubber insertion to render it gas and water tight. It is filled by coupling on the inlet branch to the outlet of a gas-meter—the same branch serving for the attachment of a flexible pipe conveying the gas to the engine. The fuel is brought to a point just above the engine throttle; an ordinary cock close to the engine controlling the supply. This cock is regulated by a lever, directly coupled to the throttle valve lever; so that the gas supply can be easily increased or diminished in accordance with the required engine speed.



The accompanying diagram, taken from the "Commercial Motor," for Nov. 2, 1916, shows an excellent connection adopted by the Beeston firm. The ordinary air inlets hold good, and a single link connected to the accelerator controls jointly the movement of the gas cock and throttle. Should the gas give-out on the road, this is easily noticed by the usual popping. The petrol is immediately turned on and allowed to run to the carburettor without its being necessary for the driver to leave his seat. It is not necessary either for the engine to be stopped for

the change-over; so that it should be possible to use coal gas for fairly long trips, making use of petrol for the balance, as no interference with the ordinary functioning of the petrol engine need occur.

MOTOR LORRIES.

The problem as applied to motor lorries is not so easily solved, as here the use of a flexible gas-bag is practically out of the question. The only reasonable way out is to store the gas in receivers under fairly high pressures—say, from about 150 lbs. per square inch upwards. This system has been in use at Neath for over fifteen years with the gas-driven tramway cars; and though the Neath car system cannot possibly be held up as an example for others to follow in designing or adapting petrol-driven vehicles for gas fuel, yet the fault of the system does not lie in the method of compressing and storing, but in the design of the gas-engines and train of gearing. The engine design comprises two horizontally opposed cylinders on a common engine bed, the cylinders being each of 7½-in. bore, and made to accommodate a piston stroke 10½ in. The maximum revolutions per minute are 250; and the maximum horse-power when new, 14·5. This indicates a mean effective pressure in the engine cylinder of only 53 lbs. per sq. in., which, when compared with modern gas-engine practice, is out of all comparison, being very much too low. The train of gearing wheels consists of a spur tooth reduction between the crank shaft and the first and second counter shafts, and a chain drive from the latter to the car wheels, and shows a total reduction of 7 to 1 in low gear and 2½ to 1 in high gear. This also compares very unfavourably with modern practice in motor vehicles. These factors are well known to the gentleman in charge of this department, and I believe at an early date the whole matter will be gone into carefully with a view to reconstruction along modern lines.

STORAGE ON MOTOR LORRIES.

Reverting to the problem of storage on motor lorries, many different views are held as to the best place for fixing receivers—some holding to them being fixed under the floor behind the back axle, and some that they should be fixed on the floor and covered with a false floor upon which the goods to be carried could be placed in the ordinary way. I am personally of the opinion that the latter method is by far the best and most likely to prove satisfactory under working conditions. The additional floor height entailed by adopting this method would not interfere very much with the loading and unloading of the goods carried. To confine the weight within reasonable limits, a battery of receivers could quite easily be made up from 8 in. to 10 in. diameter best steel piping; the receivers being connected together at one end by suitable couplings, and a connection from these taken to the engine. A special cage could be made so as to hold the receivers firmly in position and prevent any movement while the lorry was in use. It would, of course, be necessary to fit in a special type of valve for the purpose of reducing the gas pressure to the engine, and this should preferably be fitted immediately on to the outlet connection of the receivers. A very suitable reducing valve is at present in use at Neath; and as this has stood the test of time, I should recommend it strongly for the purpose.

In such a battery of receivers, made up from (say) four 6-ft. lengths of 10-in. pipe (approximate cubical capacity, 16¼ c.ft.), it should be comparatively easy to store 350 c.ft. of gas under a pressure of about 300 lbs. per square inch. Should it be required to carry a larger quantity of gas, I should recommend higher pressure being worked in place of using larger receivers, so that the weight of the battery could be kept as reasonable as possible. This amount of gas (350 c.ft.) would run an average 3-ton lorry six to eight miles before requiring to recharge the receivers, which, for local services, would be fairly convenient.

In practice, it is quite possible that coal gas will show even more economical running, as a great deal of loss takes place with petrol engines, where the power varies frequently from full load to no load, as will occur when numerous stoppages are made for the purpose of delivering goods, or in large towns from being held up in traffic blocks, due to the impossibility of maintaining under these conditions a proper admixture of air and petrol. The condition of the atmosphere in any street through which a large number of these vehicles passes proves very conclusively, from the stench left behind, the great amount of incomplete combustion taking place at times in the petrol engines. With vehicles using coal gas, this objectional feature will be greatly reduced, as it is much easier to adjust mixtures of coal gas and air to suit the varying load conditions.

GAS CHARGING STATIONS.

To meet the requirements of these converted vehicles, it would be necessary to provide charging stations at reasonable intervals, where the driver could get his receivers charged afresh. With a fleet of lorries working over a definite route, small stations could very easily be fitted up, and would certainly pay the motor proprietors handsomely; but for varied routes the difficulty of recharging would be great. I do not suggest that these stations should be provided by gas undertakings, unless probably in the larger centres where a sufficient return on the capital outlay might very easily be assured; but I do believe that gas managers can assist to a great extent by giving their experience to any firm contemplating such an installation. At Neath, the gas is compressed to 200 lbs. per square inch, and the cost works out at less than 5 p.ct. of the total cost of the gas. So compression costs need not frighten anyone. Where gas can be had at prices under 5s. per 1000 c.ft., it would be quite possible to make the necessary conversion, some fix in small compressing stations, and still save money. There is no doubt that the subject is very much to the fore in the minds of large business houses at the present time, judging from the numerous inquiries made by these firms into the possibilities of the system. At Neath alone inquiries come in almost every week from different parts of the country respecting methods and the costs of compression, storage, &c. There is no doubt that this class of consumer would be a very great asset to gas undertakings, as they would thereby be assured of a practically constant demand throughout the whole of the year, and that principally of a day-load character.

EXPERIMENTS BY THE "B.C.G.A."

I understand that the British Commercial Gas Association are conducting experiments with a view to proving the practicability of utilizing coal gas in this type of vehicle; and should their results prove—as I expect they will do—that coal gas is capable of being used in these vehicles with advantage in the running costs and upkeep of engines, it should not be long before makers take in hand the turning-out of vehicles with engines specially adapted for using coal gas, when a maximum efficiency in running will be possible of attainment. The whole system is in its infancy; but as there is no doubt as to the increasing numbers of commercial motors likely to be put on the roads in the future, it will be well worth while giving our sympathetic co-operation to those who are acting as pioneers of the movement. From their greater flexibility under traffic conditions, motor vehicles are likely eventually to displace all other methods of transport, not excepting electric tramcars; and to capture a large portion of this power business for gas is well worth attempting. There will be need, however, to show conclusively to motor vehicle proprietors that gas-motor fuel can compete with petrol. For this purpose, complete working tests showing the actual cost per mile run for the different sizes of vehicles on coal gas as compared with petrol are necessary; and these, I hope, may be forthcoming in the tests shortly to be published by the British Commercial Gas Association.

PROSPECTS.

Summarizing the information upon the subject which up to the present has been made known through the Press, and from private information given me in reply to my several inquiries, it may be stated fairly definitely:

1.—That the substitution of coal gas for petrol in vehicles of the motor bus and char-a-banc type, where a fleet is kept running over a route of anything from 10 to 14 miles in length, is not only practicable but can be effected with very little expenditure of money, and the saving over the previous use of petrol will turn out somewhat considerable.

2.—That for vehicles of the 2-ton to 5-ton motor lorry type the conversion is perfectly feasible, and the conversion will also probably result in a considerable saving being effected in the running costs. But up to the present the problem of efficiently storing the necessary quantity of gas for running reasonable distances without having to resort to petrol or to charging stations is not sufficiently solved to warrant recommending the change being made. In this connection, it will be necessary for inquiries to be made as to the actual running costs and the practicability of storing the gas effectively, and also as to whether it will be possible for these vehicles to carry their own small compressors so as to be able to take on a further charge at any town, large or small, where an ordinary supply of gas is available.

3.—That, up to the present at any rate, the use of coal gas on small road-touring cars is for all practical purposes quite out of the question.

In conclusion, I would point out that although to many gas engineers the day when large numbers of these vehicles will be running on coal gas may seem very far distant, yet it is well that we should keep a perfectly open mind on the subject, as far greater innovations have been brought about during these trying times of war conditions.

Mr. JACKSON, in concluding his paper, said he had had an inquiry from Lovell's Commercial Motor Company, of Newport (Mon.), as to filling gasholders on vehicles. Owing to difficulties in obtaining petrol, the firm had put on order a gas-container to fit on the top of one of their motor-vans, to contain about 300 c.ft. of gas. As they had vans working between Newport and Swansea, they had been wondering whether arrangements could be made with the local authorities or the gas companies, at various points on the route, for the filling of the holders.

DISCUSSION.

The PRESIDENT (Mr. J. E. Kenshole, of Merthyr) said that personally he thought there was at least a very fair prospect of good business being done in the direction indicated by the paper.

Mr. R. G. CLARRY (Swansea) remarked that they had had several inquiries in his town, but referring more to the lorry type of vehicle. The question really resolved itself, so far as he could see, into the cost of compressing and the likely return. Assuming that Lovell's scheme matured, they would require charges of gas *en route*; and if there were only a few consumers requiring the charges, the cost would be prohibitive. But they were all agreed that nothing should be wanting on their part, as gas managers, to foster the idea as far as practicable.

Mr. S. MURRAY (Aberkenfig) said the paper opened up a very wide field; but Mr. Jackson, in giving figures, referred to petrol at 2s. 2d. per gallon, for his comparative costs. When petrol came down considerably in price, the whole problem would be altered; and if the cost of compression was going to be high, with South Wales rates for gas rather high as well, he did not see how they were going to compete

with petrol at a low price. If gas undertakings were going to arrange to fit up charging stations, what was going to happen if they were called up at night, when the ordinary staff was away? Was it intended to keep men at hand to charge a vehicle if required. If so, the cost would go up. As to compression, Mr. Jackson mentioned 300 lbs. per square inch in one place, and in another 200 lbs. These were rather high for gas undertakings to deal with. Then it was stated that an average 3-ton lorry would travel six to eight miles before requiring re-charging. Unless, therefore, it was possible to get supplies *en route*, this was going to put such lorries out of court. Compressing 350 c.ft. of gas to 200 lbs. did not seem to him a paying proposition. Of course, the whole matter was at present quite in a transition stage; and the gas manager ought to do all he could to assist.

Mr. H. L. Bateman (Merthyr) asked why they should strive to supply gas for petrol motors when by quite easy means they could manufacture at the gas-works to-day a petrol substitute which gave more power than petrol itself. This has been demonstrated by the coalite experiments. He believed the product compared very favourably with petrol; and with regard to the cost of production, it was very much under the present-day price of petrol.

Mr. J. H. Canning (Newport) said the chief factor in the problem appeared to be the question of the bulk occupied by the gas, as compared with the bulk occupied by petrol. This presented a rather serious difficulty. In the case of the motor buses referred to by the author, he noticed that the whole of the upper deck was occupied by a large gasholder. Whether this would not tend in course of time to render the buses unpopular, was a matter that should be gone into carefully; and if it proved to be the case, it would be better to use compressed gas in cylinders underneath the vehicle, than adopt the gasholder on top. There was another point he did not think Mr. Jackson had drawn attention to—namely, the great convenience of starting petrol engines on coal gas. Incidentally, this opened up another field for the consumption of coal gas in garages. Probably many of those present were aware from bitter experience of the very great difficulty in starting a petrol engine after it had been standing in the cold garage all night and the petrol had got a bit stale in the carburettor. Coal gas obviated all this trouble; and many people who had to start-up a number of petrol engines in the morning now adopted a flexible gas connection for the purpose. Many large motor-works now tested engines almost exclusively by coal gas, particularly since petrol had become so scarce. He must, however, say it seemed doubtful to him, although one was very anxious to develop this business, whether they would be able to retain it after the war was over. The petrol people, he was quite sure, would be fully awake to the seriousness of losing business. They would use every endeavour to get hold of it. He had not heard anything definite as to Lovell's, of Newport. They were a firm who ran a large fleet of motor vehicles. With regard to the establishment of compressing stations, in case some of these vehicles adopted the practice of using compressed gas, these were not likely to pay the gas undertakings unless they could be sure of a very considerable and certain demand. It would not do to fit them up temporarily while the war was on, and find afterwards they were not required. They must all feel grateful to Mr. Jackson for having brought this matter forward. Every outlet for the sale of coal gas was highly important at the present moment; and the author had collected a large amount of valuable information which would be of much use to them in developing a new field for coal gas.

The President said he had been getting together some information for a motor-bus proprietor; and so far as he could see, everything appeared to be quite all right, and that it would be a paying proposition. It was not the intention at all to supply gas under pressure, but simply to use an ordinary gasholder on the top. He had written to two or three places where this plan had been adopted, and from what he could gather, the use of the system seemed to be extending fairly rapidly.

Mr. Jackson, in reply, said one of the vehicles run by Lovell's was a 2-ton van, which travelled between Newport and Swansea three days in each week. With a gasholder containing about 300 c.ft., if it travelled fifteen miles on one charging, this would mean that, on the journey to Swansea and back, it would be necessary to charge it eight times. He would be glad to know whether any of the managers on the road would be willing to provide meter-stations. The Lovell Company pointed out that, as they had a large number of customers throughout the district in which they travelled, they could probably arrange for the supply-pipes and meters to be fixed on the premises of some of them, where the gas undertakings were unable to provide places themselves. As to Mr. Murray's remarks, he had not really had an opportunity of going very deeply into the question of pressures; but, as he had mentioned in his paper, the British Commercial Gas Association were carrying out tests. He believed they would very soon be presenting a report to the members, with a lot of the figures tabulated, so as to give them the information required. Most petrol substitutes now were coming under the Government ban; and the question, when all was said and done, was to a very great extent a war-time one. As to the price of petrol, Messrs. Barton Bros. said distinctly that in Nottingham gas was equal to petrol at 8d. per gallon. It was a long time since they had seen petrol at this figure; and he thought it would be a long time before they saw it there again. Later on they would probably be able to keep the business they had secured during war times. Mr. Canning had drawn attention to the great ease of starting petrol engines by gas; and this was an important point. As to compressing stations, he did not suggest that gas undertakings should put them up. Motor-car proprietors should have the responsibility, because they would get the benefit. It would enable them to keep going; and that was what they wanted.

Mr. W. J. Jones, of the Ministry of Munitions (Refractory Materials Department), has been elected President of the Ceramic Society for the ensuing year; and the following have been elected for two years as Vice-Presidents of the Refractory Materials Section: Dr. J. E. Stead, Dr. Harold G. Colman, Prof. J. W. Cobb, Major C. W. Thomas, and Messrs. Albert Cliff, J. H. Brearley, J. Dunnachie, F. Brooke, Bernard Moore, and C. P. Williams.

FIRE-CLAY FROM A MANUFACTURER'S POINT OF VIEW.

A Meeting of the Refractory Materials Section of the Ceramic Society was held at Stourbridge on Monday of last week, when a paper on "Fire-Clay from a Manufacturer's Point of View" was read by Mr. G. H. Timmis, of Stourbridge.

The author said the manufacturer's difficulties may be caused from the material used, the method of manufacture, the design, and, indirectly, from the setting and use of the goods. But he proposed to confine his remarks mainly to the raw material, and the getting of it.

In the Stourbridge district, fire-clay is no longer quarried, but mined at all depths down to 350 yards. The necessity of using artificial light greatly increases the difficulty of selecting the clays underground. The following statements apply more particularly to the Old Mine fire-clay, which was the first seam to be worked in the neighbourhood of Stourbridge, and is largely used for making glass-pots. It lies at depths of 20 to 40 yards below the thick coal of South Staffordshire. Towards the north, the nature of the fire-clay becomes different in many respects. In this south-western area of the South Staffordshire and East Worcestershire coalfield, the Old Mine fire-clay originated probably from one or more streams bringing down sediment from primitive rocks of similar character, and other portions were supplied from different sources. East of Stourbridge the deposits are coarser. The Stourbridge district appears to have been a bay out of the main current, receiving a deposit of fine silt or mud to form the Stourbridge pot clay. Probably the coarser clay of the same seam could be treated mechanically to produce a similar material to the pot clay; but the expense would doubtless be prohibitive for the present. Chemical analysis alone is not a guide to the refractory properties; but rational analysis is different, and may offer safe guidance. The New Mine clays, now being worked, are probably derived from the same direction as the Old Mine clay, but from rocks of a different character.

There are numerous faults common to all mining, and many local disturbances that do not occur in coal mining, involving local variations in thickness. By candle light or lamp light, it is difficult to distinguish fire-clay from the clunches that lie above and below, and almost impossible to tell good clay from bad when a sudden change occurs at the face. All mining operations are carried on under some piecework system; and it is usual in the Stourbridge district to tip the clay as it comes from the pit on mounds, which not only facilitates the picking out of inferior clay and foreign matter, but provides uniform material by thoroughly mixing the clay from different parts of the pit. Assuming due care in the getting and sorting of the clay, these mounds fairly represent the best of the fire-clay seam; but in its future history, the clay has to bear the brunt of any failings. It is easier to blame the clay than admit errors in the manufacture or use of it.

Clays of similar character in other respects differ greatly as regards their drying properties. Some clays when made into bricks, unless dried very slowly, harden at the edges and become quite soft in the middle. This peculiarity does not seem to have been investigated. Shrinkage is another important feature of fire-clay, and is affected by the use of freshly-drawn clay. Fire-clay expands after being gotten; and unless this has time to take place, the shrinkage seems to be increased. The percentage of combined water and carbonaceous matter may also have a bearing on the subject which is worth scientific investigation.

The greatest difficulty of the fire-brick maker is testing his material under working conditions. Chemical analysis, rational analysis, and cone-tests are all useful, but often fail in practice. In the laboratory or experimental furnace, the stresses due to expansion and weight, the cutting action of furnace heat, the mechanical action of dust at a high velocity, or the chemical action of slags and fumes cannot be reproduced. Co-operation with the user is essential in order to promote adequate testing of new combinations of clays and new processes of manufacture.

The American system of making fire-bricks from many different grades of clay, according to their intended use, is rendered possible from the fact that work there is standardized. In the case of retort-settings, for example, a bed of sixes or of eights is the same all over the country; the retorts being not only of the same pattern, but the division walls built of purpose-made blocks. Similarly with other furnace work. So that the manufacturer can make and stock without fear of the patterns not being in demand. Here all furnaces built-up more or less with ordinary square bricks, and special lumps are designed for only a particular furnace or set of furnaces. Hence the stock of square bricks must be suitable for any purpose; while the specials are usually in too limited demand to justify departure from ordinary practice. This is perhaps not a bad thing where a good clay is available; the difference in cost (due only to initial cost of better clay) being hardly enough to encourage false economy.

The author found from examination of large consignments of German-made refractory material that a small proportion for high-grade work were not made of a natural clay, but built-up synthetically, and were of first-rate quality and price. The bulk of the goods, apparently made from a natural clay, were of very poor quality, and inferior to a good-class home-made brick. He concluded by stating that the British fire-brick manufacturer would welcome the co-operation and assistance of users; and he

hoped the Refractory Materials Section of the Ceramic Society might be the means of bringing this about.

The Scientific Management of Fire-Brick Works.

In the course of his paper on this subject, Major C. W. Thomas joined issue with the critics of the British fire-brick maker for his alleged neglect to use scientific methods. His own view was that the critics had only a very slight knowledge of the problems which face the fire-brick maker, but also of the precise extent of the technical data at his disposal, and had generally refrained from giving helpful constructive suggestion. Those in close touch with the position knew that a good deal of research work in refractories had recently been carried out under the auspices of the Ceramic Society; and there was every indication that the various technical institutions which were taking up the investigation of the subject would before long be able to make good the gaps in knowledge that now existed. Pending the accumulation of the necessary technical data, there were many problems connected with the manufacture of fire-bricks to which the maker should give his attention, as it was quite certain that the conditions governing the use of refractory materials were going to be very different in the future from what they had been in the past. The higher temperatures and the greater productivity of industrial furnaces were already making greater demands on the resisting power of all refractories, with the result that the question of supply and demand had been lifted to an entirely different plane. Those who so strongly advocated the adoption of German methods of making fire-brick goods entirely overlooked the great difference between the German and British fire-clays, and did not realize that processes which were satisfactory in the one case, because of the nature of the clays used, were certain not to give parallel results when applied to entirely different clays. If he might outline the course inquiry should now take, it would include the question of the mining and selection of raw materials; the particular requirements of various industries; the blending and preparation of bodies; and methods of making as well as of drying and burning. Physical composition was of equal importance with chemical analysis. There was no doubt that mechanical methods of manufacture were capable of being developed to a considerable extent; and fresh consideration should be given to the question of gas-firing. With regard to the control of furnace temperatures, no instrument suitable for ordinary brick-works' use had yet been devised.

Inverkeithing Gas Company.—The Inverkeithing Gas Company show a net profit for the year of £560, which, with the amount brought forward, gives a total of £761. The reserve fund is now £800. A dividend of 8¾ p.ct. (less income-tax) is declared on the ordinary shares. The Town Council have decided to abandon the proposal to acquire the works, and have agreed not to serve any notice upon the Company for a period of ten years in respect of the acquisition of the concern. The Company have expended £593 in connection with preparing a case for arbitration.

Increased Charges for Gas at Leeds.—The Leeds Gas Committee have decided to recommend the following increases in the price of gas, as from the June reading of the meters: 2d. per 1000 c.ft. for motive power and furnace work, making the charge 1s. 11d.; 1½d. per 1000 c.ft. for lighting, cooking, and heating, on the present price of from 2s. 8d. under 500,000 c. ft.to 2s. 4d. over 2,000,000 c.ft.; and 1d. per 1000 c.ft. for prepayment meters, on the present price of 2s. 11d. The increases have been rendered necessary largely by the cost of coal and of war allowances.

Leeds Gas-Works Accounts.—The gas accounts for the year ended March 31, submitted to the Leeds Corporation Gas Committee last week, show a surplus profit of £1175, as compared with £14,838 in the previous year. The total income was £490,652, and the working expenses £356,328, leaving a gross profit of £134,324, an increase on the previous year's gross profit of £8025. War allowances £3965, taxes £11,330, interest on loans £47,545, redemption fund charges £49,723, and capital and other items £20,585, are charged against the gross profit. The total income of the year increased by £55,000; while the expenditure increased by £47,610.

Price Increased at Manchester.—The proposal of the Gas Committee to increase the price of gas 6d. per 1000 c.ft. was assented to by the Manchester City Council at a special meeting last Wednesday. The new scale will come into force at the end of June. The present price is 2s. 8d. per 1000 c.ft. to city consumers, and 2s. 11d. outside. Alderman Kay (the Chairman of the Gas Committee) said it was deplorable that they had to raise the price; but the advance was due to circumstances over which the Committee had no control. The chief reason was the pernicious system, insisted upon hitherto by the Council, of exacting large contributions from the trading departments in aid of the rates, whether or not the departments made a profit.

Bothwell and Uddingston Gas Company, Ltd.—The Directors, in their report for the year ended April 30, state that the balance at the credit of revenue account, after charging all renewals and bad debts, amounts to £4091. Deducting interest and income-tax, there is a sum at the credit of the profit and loss account (including £840 brought from the previous year) of £3663. After the payment of dividends, less income-tax, at the rates of 11¾ p.ct. per annum on the original capital, and £8 4s. 6d. p.ct. on the additional capital, there will remain £1042 to be carried forward to next year. The working statistics of the Engineer and Manager (Mr. Lawrence Hislop) show that the make of gas per ton of coal carbonized was 14,450 c.ft., and the sale 14,025 c.ft. The coke sold per ton of coal was 8·64 cwt.; tar, 19·17 gallons; sulphate of ammonia, 37·72 lbs. The total quantity of gas manufactured was 100,400,000 c.ft., which is 4,650,000 c.ft. less than in the previous year. The total revenue from residuals works out at 16s. 8d. per ton of coal carbonized, and 13·8d. per 1000 c.ft. of gas made.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Gas Companies and Electricity Deficits.

SIR,—I would like to emphasize your comments (p. 329) on the above subject in the last issue of the "JOURNAL."

I am very glad to see that the South Suburban Gas Company have taken a stand in this matter, which I hope will receive due attention in other quarters. Assuming hostilities continue over next winter, it is fair to anticipate that the difficulties in carrying on many gas undertakings will be even worse than hitherto experienced. Having regard to these difficulties and the effects of processes, *re* explosives, adopted in the national interest, it does seem more than ever extraordinary that municipalities in competition with gas companies should be permitted to supply electricity at such figures as result in heavy deficits, and enable the unscrupulous to take advantage of the position in various ways.

Hastings, May 25, 1917. CHAS. F. BOTLEY.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Sheffield Gas Company's Bill.

The Sheffield United Gas Light Company's Bill was brought from the Commons, read the first time, and referred to the Examiners.

HOUSE OF COMMONS.

Progress of Bills.

The Kenilworth Gas Bill and the Gas and Water Provisional Orders Bill were read a second time, and committed.

The Haslemere and District Gas Bill, the Hemel Hempsted Gas Bill, and the Lea Bridge District Gas Bill were before the Unopposed Bills Committee on Wednesday, and were reported, with amendments.

The Sheffield United Gas Light Company's Bill was read the third time, and passed.

Federation of British Industries.

Mr. PENNEFATHER asked the President of the Board of Trade what was the number of firms included in the Federation of British Industries, their aggregate capital, and the number of employees.

Mr. G. H. ROBERTS said he was informed by the Federation of British Industries that the membership comprised 355 firms and 58 associations; and there were also some 2500 associate members. He could not furnish any accurate statement of the aggregate capital and number of employees of the firms included in the Association; but it might safely be stated that the figures in both cases would be very large.

Mr. PENNEFATHER inquired whether the Federation, as being the largest representative body of employers, had been consulted in regard to recent legislation or actions affecting industry, with a view to solving difficulties between capital and labour and furthering the common interests of employers and employed; and if this had not been done hitherto, would the advisability be considered of such consultation in the future.

Mr. BRIDGEMAN replied that in all matters affecting a particular industry it was the practice of the Ministry of Labour to consult the representative bodies both of employers and workmen connected with the industry. In the event of it becoming necessary to consult representative employers in regard to matters affecting industry as a whole, the Federation of British Industries would not be overlooked.

Imperial Continental Gas Association Claims.

The following reference to claims lodged by the Imperial Continental Gas Association appeared among the City Notes of "The Times" last Friday: The stock of the Imperial Continental Gas Association has lately been attracting some attention from the speculatively inclined, in spite of the fact that no dividend has been paid since 1915. The explanation of this seems to be that very large claims have been made by the Association against the Central Powers at the invitation of the Foreign Claims Office, Foreign Office. At June 30 last, claims in respect of the Association's German establishments amounted to £11,251,660, in respect of the Belgian properties to £3,226,933, and in respect of the works in Bohemia to £1,235,355—making a total of £15,713,948. On the other hand, the German and Austrian Governments have taken steps to liquidate the concern by offering its works for sale. What value, therefore, should be placed upon these claims is an interesting problem, in which one of the unknown factors is the post-war value of the mark. The Association have sold their shares in the Frankfurt Gas Company to the Municipality for £941,320; but payment will not be made until six months after the declaration of peace. In addition to their German interests, the Association have a number of substantial investments in France—at Lille, Nancy, Pont-à-Mousson, and Toul. Some of these works have been badly damaged. The financial position of the Association at home is strong; Treasury Bills, loans, bank balances, and saleable securities, taken at present prices, amounting in all to £973,000. Including the French investments at the book value and the claims against the enemy Powers, the total assets amount to £17,568,843. The debenture debt is £1,235,000; and the capital stock is £4,940,000. There is thus a wide margin between liabilities and assets, which may explain the rise in the stock of about fifteen points in the past month.

MISCELLANEOUS NEWS.

A SUCCESSFUL YEAR AT LANCASTER.

Mr. Cecil R. Armitage, the Engineer and Manager of the Lancaster Corporation Gas-Works, in his report for the past year states that the total receipts for gas were £53,506 and the expenditure £32,898, leaving a gross profit of £20,608. Out of this sum £2437 has been paid for interest on stock and mortgages, £3271 has been added to the redemption fund, and £2490 has been paid for income-tax, which leaves a net profit of £12,409. The sum of £1000 has been given in aid of the rates; while the balance of £11,409 has been placed to reserve.

The total sales of gas, exclusive of that supplied to public lamps, were £36,830, or an increase of £13,844. Residuals realized £15,064, or equal to 75·36 p.ct. of the cost of coal. The average price received per 1000 c.ft. of gas sold was 2s. 7·82d. Of this sum, gas cost 1s. 0·53d.; new mains, services, and meters, 1·48d.; income-tax, 2·15d.; interest on stock and mortgages, 2·11d.; and redemption fund, 2·83d. The net profit was 10·72d. per 1000 c.ft. The total cost of coal was £19,989, or an average of 18s. 6·81d. per ton, as against 16s. 6·30d. in the preceding year.

The cost of remodelling No. 2 retort-bench (£8011) and payments (£6795) so far made for the carburetted water-gas plant, have been added to capital account during the year; while the sum of £1721, the cost of new mains, services, meters, and prepayment stoves, has been charged direct to revenue. The leakage or unaccounted-for gas was 2·94 p.ct. The net cost of gas (1s. 0·53d. per 1000 c.ft. sold) and the return from residuals (75·36 p.ct. on the cost of coal) would compare favourably with other gas undertakings. The demand for gas was fast approaching the maximum capacity of the plant; and considerable extensions will have to be undertaken in the near future.

COLNE CORPORATION GAS DEPARTMENT.

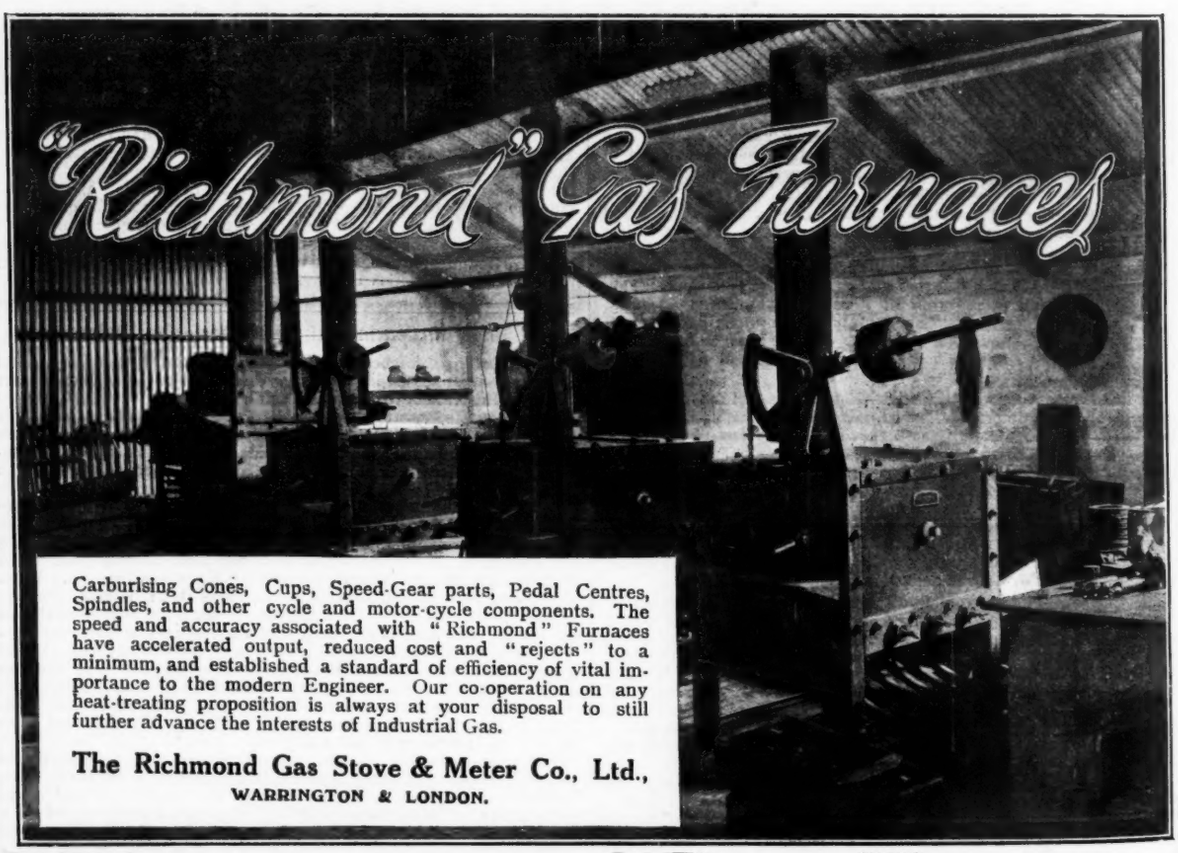
Reporting on the past year's operations to the Colne Corporation Gas Committee, Mr. Fred. Thorpe (the Gas Engineer and Manager) says the expenditure for the twelve months was £28,014, and the income £33,659, leaving a gross profit of £5645. As interest and contributions to the sinking fund absorbed £4888, the net profit was £756—a reduction of £1185 when compared with that for 1915-16. At the beginning of the year, the Department could not see any probability of making a contribution to the general district fund; but notwithstanding a fall in the consumption of gas and the higher rate paid in wages, something has been accomplished in this direction, though only by rigid economy in management. Although there was a saving of £1150 in coal, due to an increased yield in the gas obtained per ton, the total account only shows a net saving of £200. Income-tax was higher by £600; and reduced consumption of gas is represented in the public lighting account by £560. The income from the residuals was lower by £386.

In the twelve months, 13,459 tons of coal (slack, unscreened coal, washed nuts, and cannel) were carbonized; being a decrease of 1552 tons as compared with the previous year. The average price per ton delivered at the works was 19s. 6d., against 17s. 8d. The average quantity of gas produced per ton of coal was 12,990 c.ft., easily a record for the works; and in obtaining this yield, there has been a saving of 1159 tons of coal, valued at £1150. The additional cost of coal during the past year, compared with pre-war rates, was £3901. The total quantity of gas manufactured was 174,823,000 c.ft., a decrease of 2·9 p.ct. on 1915-16. The gas sent out amounted to 174,951,000 c.ft., or a decrease of 2·8 p.ct. The reduction in street lighting was 4,768,000 c.ft.; so that the net decrease by all other consumers amounted to 0·1 p.ct.

ROTHERHAM GAS-WORKS RESULTS.

In his report to the Rotherham Corporation Gas Committee on the working of the gas undertaking for the year ended March 31 last, Mr. J. S. Naylor (the Engineer and General Manager) states that the quantity of coal carbonized during the twelve months was 23,644 tons, at a cost of £19,550, or 16s. 6·44d. per ton, as against 24,270 tons in the previous year, which cost £17,471, or 15s. 2·6d. per ton. The quantity of gas made was 321,515,000 c.ft., which was a decrease of 4,849,000 c.ft. The make per ton of coal carbonized (which constitutes a record for the department) amounted to 13,598 c.ft., as against 13,406 c.ft., or an increase of 192 c.ft. per ton. The sales of gas, at 285,599,000 c.ft., exhibited a decrease of 4,029,000 c.ft., or 1·4 p.ct., which was entirely due to the lighting restrictions. The unaccounted-for gas was 10·27 p.ct. of the make, as against 10·05 p.ct. the year before.

The cost of public lighting in the borough, including wages and maintenance of lamps, was £932, which is a decrease of £1805 on the preceding year. The gross profit (after making ample allowance for depreciation) is £15,708, which compares with £16,449, and is a decrease of £741. In the net profit (after allowing for interest, redemption instalments, and contributions to sinking funds) there is a decrease of £1197; the amount being £5883, as against £7080. If, concludes Mr. Naylor, the gas for public lighting (£176) is again given by the department, as in former years, and a sum of £1300 is set aside as before, as a provision for excess profits duty, there is an available surplus profit of £4408, being a decrease of £347 on the previous year.



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BRIGHOUSE GAS-WORKS ACCOUNTS.

Reporting to the Brighouse Corporation Gas Committee upon the working of the undertaking during the past financial year, Mr. H. Davies, the Gas Engineer and Manager, says that the output of gas, as compared with the previous year (150,042,000 c.ft.), shows a decrease of 1,915,000 c.ft., or 1·26 p.ct. The quantity sold, as per rentals, exhibits a decrease of 4,193,100 c.ft., or 2·97 p.ct.; and this is accounted for principally by the reduced consumption of the public lamps. The unaccounted-for gas amounted to 11,885,400 c.ft., or 7·92 p.ct. of the output. This is an increase upon the previous few years; but the very severe winter, accompanied by a series of leakages occasioned by fractured mains, and the disconnecting of the Birds Royd works and the laying of a gas-main explain the increased loss under this head.

Slot-meters accounted for 26·27 p ct. of the total gas sold, and show the substantial average consumption of 12,190 c.ft. The average make of gas per ton was 11,492 c.ft.—a very satisfactory yield, taking into consideration the reduced class of fuel occasioned by the shortage of labour at the collieries for screening and picking. The efficiency of both the manufacturing and distributing operations—especially the latter—has been somewhat impaired by the extent to which the undertaking has given up skilled and trained hands; but, on the whole, the results may be considered very gratifying. The yield of residuals was exceptionally good, and both in volume and money value exceeds any previous year *pro rata* with the weight of coal carbonized. Purification again shows a profit, and is good testimony to the efficiency of this part of the operations.

The past year has severed the connection entirely with the manufacturing and distributing plant at the Rastrick Gas-Works; the whole of the operations now being centred at Mill Lane. Upon the completion of the new coal-store, which work is well in hand, Mr. Davies has every confidence that the works will be in a position to manufacture gas even more economically than of recent years.

ECONOMICAL USE OF FUEL.

An address on the economical use of fuel for domestic purposes was delivered by Prof. Radcliffe, of the Manchester School of Technology, to the Institute of Plumbers, of which he is an honorary member. Prof. Radcliffe observed that the long-continued and strenuous efforts to prevent pollution of the air by smoke in the immediate vicinity of large towns had, to a limited extent, been successful in reducing the well-known evils associated with a smoky and dusty atmosphere, and the loss resulting from waste of fuel. Very little headway had been made, however, in the reduction of smoke from other sources, or in the economical use of fuel in private houses and small establishments to which the Public Health Acts do not apply, though considerable improvement had been effected in the design and construction of fire-grates and other apparatus available for use in such premises. Tenants and prospective occupiers should exert all their influence to secure for use only those appliances from which the maximum heat value was obtainable from fuel. The possibility of the loss of heat from any source should be brought to a minimum. The temperature of escaping gases should be reduced to as low a point as practicable, consistent with efficiency; and the waste of steam or hot water was direct loss, which should be avoided.

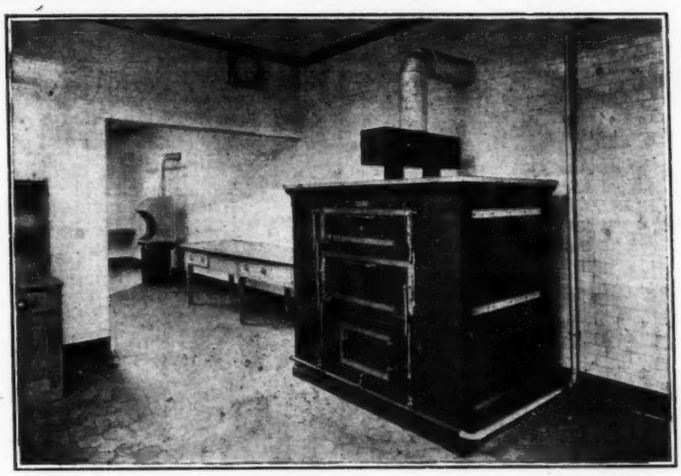
It was an erroneous impression entertained by many people that the open kitchen range was necessary where a supply of hot water was required, and that the heat for this purpose was obtainable without cost from the kitchen fire, by means of the boiler at the back. The principal part of this heat passed through the chimney, and was direct loss. The average quantity of hot water used each day was 21 gallons; and, to supply this at 180° Fahr., about 19 lbs. of coal was consumed. As a general principle, it was desirable to discourage the use of the wasteful open fire grates of the kitchen-range type, and encourage the use of more modern grates. The "parlour grate," so called, would prove more useful, and in every sense more economical. A movable or revolving hob would add to its value for cooking purposes, and where supplemented by a small gas-ring or a cooking-stove would reduce the coal consumption to an astonishing degree.

Special attention should be given to gas-fires for heating, and appliances used for cooking by gas. The fire-back boiler should be discarded as obsolete and wasteful to a high degree. For supplying small quantities of hot water, an approved form of apparatus heated by gas would give better results; but unless carefully designed the full advantages could not be gained. The present prices of the appliances restricted their use; but there was considerable scope for invention in this direction. It should be possible to transfer the heating value of coal gas to the water required, without serious loss of heat, at much less cost than at present. The adoption of the gas-heater to existing appliances was not an unqualified success, as in many instances the upper circulating pipe was connected to the cylinder at a low point, and practically the whole of the water in the cylinder must be heated before a small quantity of hot water could be obtained from the taps. Careful design and accurate fitting were essentials of success.

For installations of medium size, and to satisfy the demand for a large volume of hot water in any building, the fire-back boiler was wasteful. It could not compete for efficiency with many of the self-contained boilers, coke being used as fuel; but special precautions were necessary to prevent loss of heat by radiation. Modern boilers of suitable type gave excellent results, with a trifling amount of attention and a very small quantity of fuel, which was easily obtainable, at a comparatively low price, from the gas-works.

The Droitwich Corporation Gas Department have increased the war bonus to their employees by 5s. per week, making it 8s.

FOR BREAD BAKING



MAIN'S "REGENERATIVE" GAS OVENS

(AS INSTALLED AT MELBOURNE HOSPITAL)

A GREAT LABOUR AND FUEL SAVER.

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.
SHOW-ROOMS AND BRANCHES: 25, PRINCES STREET, OXFORD CIRCUS, W.; 136, Renfield Street, GLASGOW; 83, Old Market Street, BRISTOL; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

GAS-HEATED HOT WATER SUPPLY.

In a paper prepared to be read before foremen of the fitters of the Gas Light and Coke Company on Monday of last week, Mr. Thomas Potterton, of Balham, gave much practical information in connection with gas boilers or circulators and the correct methods of fixing them.

Quoting the results of a test of a No. 20 "Victor" boiler connected to a 20-gallon cylinder, with 1 in. flow and ¾ in. return, taken last February, with an initial temperature of water of 38° Fahr., he said the readings showed that in the winter-time, with cold water below 40° Fahr., a single warm bath requires a consumption of at least 40 c.ft. of gas, starting with the apparatus quite cold, although successive baths would be obtained for 30 to 35 c.ft. In the first place, the metal of the boiler and cylinder has to be heated, and then the measuring tank, all of which absorb heat in rotation, and reduce the temperature of the water available for use. They nevertheless demonstrate that it is unnecessary to burn gas during the night in order to obtain the early morning bath or hot water for other purposes, provided the apparatus is properly constructed. In estimating gas consumptions for hot baths, allowance must be made for additional heat losses where varying distances for delivery require secondary circulations, or where large baths are fitted. In the foregoing instance, the conditions were favourable in these respects, and could be taken as an example of what would occur in a flat or small private house. But for larger dwellings, the primary heat losses might be such that 50 to 60 c.ft. of gas in winter-time at the least would be required, or the consumer might ask for a larger quantity of water than 20 gallons.

With regard to the position of the flow-pipe connection to the cylinder, in all cases of single boilers the flow should be carried into the expansion-pipe (or secondary flow), rather than into the side of the cylinder, in order to avoid the high-temperature flow water mixing with the bulk in the top of the cylinder. When, however, two or more boilers are fitted, the additional flow-pipes can be carried into the side of the cylinder as close to the top edge as possible. The cold feed inlet was dealt with; a case being cited in which a request was received to inspect and report upon a failure to obtain hot water, as, although the whole of the cylinder might be well heated, the consumer could only draw tepid water for use. The trouble was seen to be due to the arrangement of the cold feed. It was connected vertically to the return of the kitchen boiler, and the flow-pipe of the circulation carried into the secondary flow-pipe; so that a portion of the in-coming cold water passed through the boiler when drawing, and delivered a mixture at the tap. The flow-pipe of the range boiler was already connected into the secondary circulation, for which reason the gas-boilers circulate into the top of the storage. This is quite satisfactory in the case of twin boilers; and it was only necessary to disconnect the cold supply and carry it separately into the cylinder, when high-temperature water was available in fifteen minutes after lighting-up. Apart from the questions affecting the temperature of water due to mixture, it is undesirable to connect the cold-water inlet to the return-pipe of a gas-boiler, as by so doing the boiler is subject to quick changes of temperature when drawing water rapidly, to which cast iron, largely used in boiler construction, is susceptible. A safeguard against the influence of this difficulty, however, occurs with "Victor" boilers, which are constructed in sections, and heat in rotation from the return inlet. In these circumstances, the in-coming cold water cannot have direct contact with the hottest section, where 90° difference would exist; and, being thus tempered in its passage through the cooler castings of the boiler, renders trouble from this cause practically unknown. It is, however, apparent that with boilers formed of single castings the importance of avoiding direct contact of the cold-water inlet with the boiler cannot be too strongly stated. On the other hand, instances are not uncommon with cylinder-systems where the temperature of water drawn is affected by a mixture of the cold with the hot, owing to peculiar conditions. The correct position for the cold-water inlet to all storages is horizontal and as close to the bottom as possible. In the foregoing examples, dealing with the installation of gas-boilers to work in conjunction with the kitchen-range, the circulation of each boiler is taken as being quite separate from the other; and before leaving this subject, emphasis was laid on the importance of adopting this arrangement in all cases of cylinder systems.

The flow and return of a gas-boiler should never be connected into the circulation from the kitchen range, as, although to insert the necessary branch tees for the connection of a gas-boiler may involve considerably less labour than opening the cylinder and drilling, the results obtainable are never the same. With large houses, or a heavy demand of hot water for early morning baths, &c., it is sometimes an advantage to install twin boilers; but these should only be adopted when the existing circulation is of 1¼-in. piping or larger. In fitting gas-boilers in pairs, separate vertical connections should be carried to a point near the ceiling-line before joining into the new 1¼-in. mains which connect them to the existing apparatus, in order to avoid inter-circulation between the gas-boilers themselves. It is further necessary to note that all flows and returns must have a continuous gradient of not less than 1 in. in 10 ft. from the boiler, which is a golden rule to be carefully observed in all circulating systems.

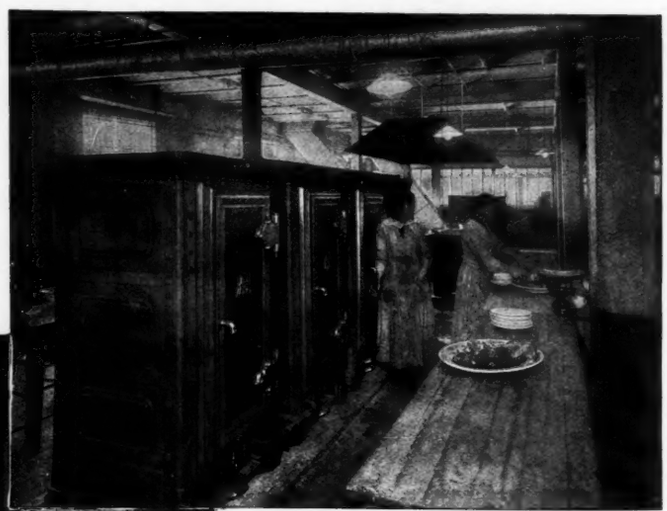
The paper concluded with some information as to the arranging of tank-systems in flats.

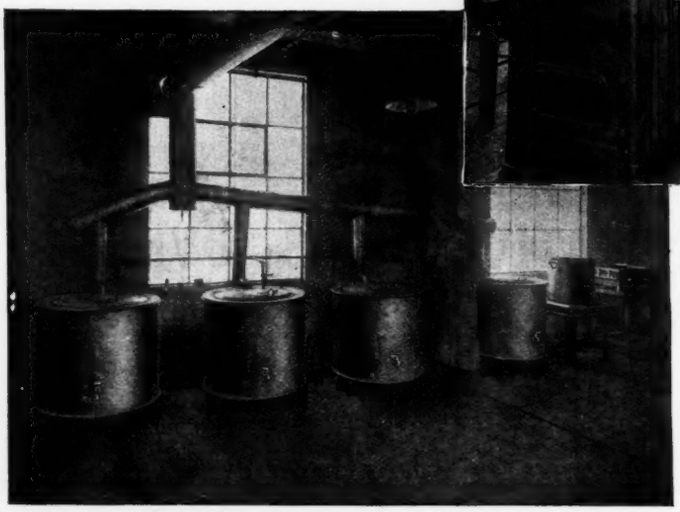
Huddersfield Gas-Works Report.—At a meeting of the Gas Committee of the Huddersfield Corporation, the Engineer (Mr. Harold Singleton) submitted his annual report, which showed the sale of gas to have been 916,308,000 c.ft., as against 953,842,000 c.ft. in the previous year. The reduction is accounted for by lessened street and shop lighting and the effects of the Summer Time Act. There was an increased yield of gas per ton of coal carbonized of over 800 c.ft. The financial result for the year showed a net profit of £7991.

ARDEN HILL'S

Gas-heated

COOKING, HEATING, & HOT-WATER APPARATUS





FOR CANTEENS, HOSPITALS, &c.

New fully illustrated List now ready. — Write to

ARDEN HILL & CO.,
Acme Works,
BIRMINGHAM.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *May* 25.

Market conditions in London remain generally unaltered. Business has been done in pitch at 37s. to 37s. 6d. net per ton f.o.b. makers' works; and although the weather is so warm, ships are being loaded almost constantly. Creosote is worth 4¼d. to 4½d. net per gallon in bulk, and 90/160 solvent naphtha about 2s. 1d. net per gallon.

Sulphate of ammonia is still wanted by the farmers on the basis of the official price.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *May* 25.

Permission to make shipments abroad is still unobtainable, and consequently export values remain entirely nominal. The price for home agriculture continues to be fixed at £15 10s. per ton to middlemen and £16 per ton direct to farmers, net cash, in makers' bags, carriage paid to destinations in Great Britain and Ireland.

Nitrate of Soda.

The market for this material remains very firm on spot, and values are well maintained at 25s. 9d. per cwt. for ordinary quality and 26s. 3d. for refined.

Howth Township Gas Lighting.—The King's Bench Division of the High Court of Ireland having given judgment in favour of the Local Government Board Orders for constituting Howth a township under the Towns Improvement (Ireland) Act, 1854 (to which objection was taken by the Rural District Council, but by no property owner, ratepayer, or householder in the district), necessary schemes of improvement are expected to be proceeded with as soon as possible. These, it is anticipated, will entail an extension of gas lighting.

Dukinfield Gas-Works Results.—In his report on the past year's working, Mr. William Lindley, the Manager of the Dukinfield Gas-Works, says that, owing to the shortage in coal supplies, the quality has not been up to the standard; and this has resulted in a considerable decrease in the make of gas per ton of coal carbonized. A decrease in the sales of gas (85,759,000 c. ft.) of nearly 8,000,000 c. ft. is explained by the restrictions in lighting. Prepayment consumers took 20·4 p. ct. of the gas accounted for. There were 8291 tons of coal used; the average price being 20s. 3·66d. per ton. The gas produced from this was 97,485,000 c.ft.; the percentage unaccounted for being 12·02. The make per ton of coal was 11,757 c.ft., as against 12,787 c.ft. the preceding year. On the working there was a gross profit of £3046, and a loss of £957.

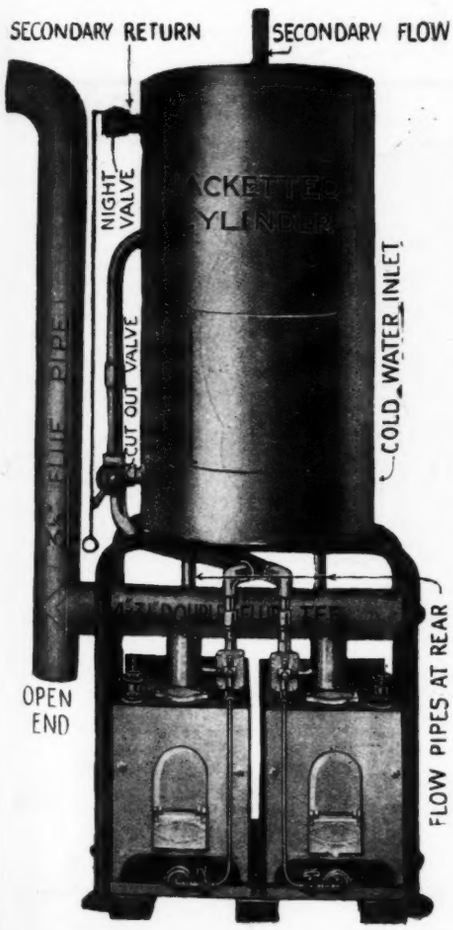
COAL TRADE REPORT.

Northern Coal Trade.

The coal trade has been rather more active in the past week; the preparation for the holidays being usual. There has been a strong home demand for fuel. Shipments have been heavier, though the lack of steamers has been still felt. Best Northumbrian steam coals are steady at 30s. per ton f.o.b.; second-class steams are quiet at from 22s. to 22s. 6d.; and steam smalls are dull—the price varying from 16s. 6d. to 18s. 6d. Freights are very firm—so much of the home tonnage having been commandeered, and neutral vessels being sparingly offered. In the gas coal trade, the home consumption is good for this season, and there is a fair shipment on the long contracts. Best Durham gas coal is from about 25s. to 26s. per ton f.o.b.; second-class descriptions are quiet at from 16s. 6d. to 18s.; and "Wear specials" are unaltered at from nominally 28s. 6d. to 29s. 6d. The output of gas coal has been fairly good; but there is the possibility of more miners being taken from the northern collieries. Freights on gas coal are a little easier—19s. having been accepted Tyne to London. Little is heard as to the large contracts for gas coal that are usually in the market at this time of the year; but it is thought that some progress is being made with their renewal at something like the prices that ruled last year. How far such contracts may be influenced by the Coal Controller, as to the duration, remains to be seen. Good gas coke is quoted from 31s. to 32s. 6d. per ton f.o.b. There are fair exports of coke, despite the freights, which are still based on about 45s. per ton to the ports in the north of France.

Wilts County Gas Company.—According to a notice in the "London Gazette," a petition for the winding-up of this Company was last Tuesday presented by Messrs. Cleeves and Co., coal merchants and factors, of Fenchurch Street, E.C.; and the matter will be heard by Mr. Justice Neville on the 12th prox.

Zeppelins and Gas Apparatus.—In a statement intended to allay possible fears of explosions of gasholders, &c., in the event of Zeppelins ever reaching the United States, Mr. R. E. Livingstone, of the New York Consolidated Gas Company, has issued a statement which reads: "Comparatively little damage has been done to English gas plants as the result of Zeppelin raids. In only two or three cases during the war have gasholder tanks been damaged. Gasholders have never been known to explode. They cannot explode. When the gasholders have been hit by bombs dropped by Zeppelins, the gas has simply escaped through the torn sides or tops of the holders. Gas-meters never explode. During a fire, the pipe connections may be burned away, and the escaping gas may become ignited. In England, buildings have been wrecked through the dropping of bombs, and the house-piping has been destroyed. In only one or two cases did the bombs cause the escaping gas to ignite."



Gas-Heated

HOT WATER SUPPLY

The VICTOR Complete Apparatus as supplied to the order of the War Office, Admiralty, Hospital Committees, Munition Workers' Canteens, Communal Kitchens, and for other duties of National Importance.

Illustration shows No. 112 Apparatus having twin Boilers, 50 Gal. storage and general accessories.

Catalogue on request.

THOMAS POTTERTON,

Cavendish Works,

Balham, ——— LONDON, S.W. 12.

Cape Town and District Gas Company.

In submitting to the shareholders at the meeting to-morrow the accounts of the Company for the year ended Dec. 31, the Directors will report that the result of the year's working is a profit of £25,556, which, with the sum of £1837 brought forward, makes a total of £27 393 to the credit of the profit and loss account. Out of this, debenture and debenture stock interest to Dec. 31 has been provided. The sum of £2320 has been written-off for depreciation of stocks, including appliances and fittings let out on hire, £5000 transferred to the reserve and contingency account, and £3000 to the reserve for plant, &c., renewals account, leaving a balance of £8733, out of which a half-year's dividend on the preference shares has been paid, absorbing £2250. The Directors propose to pay a further year's dividend on the preference shares, which will absorb £4500, and to carry forward £1983. During the year, the negotiations referred to in the last report for paying off 6 p.ct. registered first mortgage debentures at the rate of £2500 per annum, instead of £5000 per annum, were finally completed. The whole of the short-term loans due by the Company (which amounted at Dec. 31, 1915, to £8500) have been repaid. All stocks have been valued at cost, or market prices where such prices are lower than cost, and adequate provision has been made for bad and doubtful debts. The number of gas consumers at the end of the year was 6707, an increase of 162 for the year. The matter of re-constructing further portions of the old carbonizing plant has engaged the Directors' careful attention, and will require to be dealt with at the earliest date circumstances will permit. The portion already reconstructed continues to work well. A further £3000 has been transferred to the reserve for plant, &c., renewals account, making it £6000. The Directors add that the progress of the Company from the end of 1916 to the present continues satisfactory.

Meters Ltd.—The shareholders of Meters Ltd. met last Friday in Manchester, when the Directors reported that the trading for the twelve months ending March 31 resulted in a gross profit of £29,828, which was reduced by general management expenses, Directors' fees, legal charges, expenses on patents, income-tax, and depreciation of buildings, machinery, and plant. A sum of £3654 was spent out of revenue on repairs and renewals. After providing for interest on the debenture stock, the net profit amounted to £16,786, which with a sum brought forward made £20,730, out of which interim dividends at the rate of 5½ p.ct. per annum upon the preference shares, and at the rate of 4 p.ct. per annum upon the ordinary shares, were paid last November. The Directors recommended that further dividends be paid at the rate of 5½ p.ct. per annum upon the preference shares, and 10 p.ct. per annum upon the ordinary shares (making the ordinary dividend 7 p.ct. for the year); that £2000 be added to the reserve fund (raising the fund to £108,000); and that the balance (£4027) be carried forward.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for May 23.]

Nos. 6808—7273.

Allwright, H.—"Lighting coal-fires with gas." No. 6836.
Bagley, D.—"Regenerative coke-ovens." No. 7138.
Bassett, P. R.—"Detecting presence of gases in gaseous mixtures." No. 6892.
Bowrey, S. E.—"Apparatus for fractional distillation." No. 6939.
Chillington Tool Company.—"Gas and air mixing-appliances." No. 7145.
Heyl, G. E.—"Combined distillation of coal or shale with by-products of coal-tar distillation" No. 6845.
Keith, G. & J.—"Gas-lighting torch." No. 7165.
M'Lachlan, R. W.—"Bunsen burners" No. 7048.
Nettleton, L.—See Chillington Tool Company. No. 7145.
Park, J.—"Burner for constant-pressure combustion engines." No. 7059
Richmond Gas Stove and Meter Company.—"Steel furnaces." No. 6821.
Smith, E. W.—"Diaphragm for gas-meters." No. 7183.
Thompson, J.—See Richmond Gas Stove and Meter Company. No. 6821.
Tully, C. B.—"Valve arrangements for gas-producers." No. 6876.
Turner, A.—See Allwright. No. 6836.

NEWSPAPERS FOR NEUTRAL COUNTRIES.

The Secretary of the War Office has issued the following order:

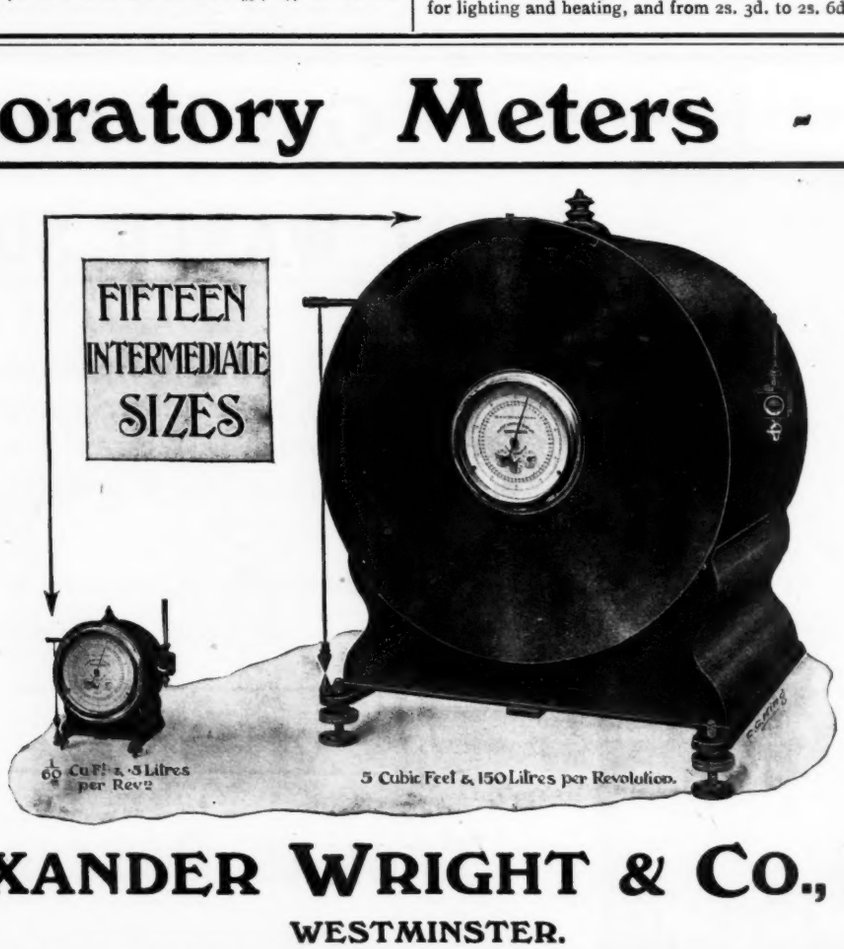
> The public are informed that newspapers and other printed publications will not be sent to Neutral Countries unless they are posted direct from the office of publishers or newsagents who have obtained permission from the War Office for this purpose. Persons desiring to send newspapers, &c., to Neutral Countries should, therefore, give their orders for execution to publishers or newsagents who have obtained such permission.

The Publisher of the "Journal" has obtained the required permission of the War Office; and he will, on receipt of instructions forward copies direct from the office to any neutral country.

The London County Council estimate that, owing to the restriction of lighting, the gas and electricity used in their schools will cost £2405 less than last year, on a total vote of £32,730.

The Doncaster Corporation, meeting in committee, decided last week to advance the price of gas from 2s. 6d. to 2s. 9d. per 1000 c.ft. for lighting and heating, and from 2s. 3d. to 2s. 6d. for power.

Laboratory Meters - - -



ALEXANDER WRIGHT & CO., LTD.,

WESTMINSTER.

Agents: Australia—FYVIE & STEWART, 360, Collins St., Melbourne; Canada—W. P. ROPER, 502, Merchants' Bank Building, Montreal.

Coal Industry in British India.—At March 31, 1916, there were 142 joint-stock coal companies at work in Bengal, and two in Bihar and Orissa. According to a report prepared by the Department of Statistics, Calcutta, these companies accounted for 77 p.ct. of the total output of the coalfields in these Provinces in 1915. There were outside the Provinces only six joint-stock companies at work during the year. The paid-up capital of these 150 companies was £5,013,333, as compared with 66 companies having a paid-up capital of £1,343,333 in 1906-7.

Price of Gas at Bradford.—It is expected that at their next meeting the Bradford Gas Committee will consider the question of an advance in the price of gas. The recent "Budget" statement of Sir James Hill, M.P., the Chairman of the Finance Committee, showed that a deficit of something like £25,000 is expected on the gas undertaking; and so the prospect of an advance causes no surprise. The price was raised on July 1, 1915, from 2s. 1d. to 2s. 6d. per 1000 c.ft.; and it is suggested that the further advance will have to be a substantial one. In the year prior to the outbreak of the war, the deficit on the undertaking was £865; while at the end of 1914-15 it had developed to £14,499. As a result of the increased price, the deficit for 1915-16 was only £2825; but the figure for 1916-17, as announced by Sir James Hill, is expected to be fully £25,000.

The Southampton County Council have expressed the opinion that they regard as very unsatisfactory the action of the Board of Agriculture in withholding consent to a prosecution under the Fertilizers and Feeding Stuffs Act, 1906, in connection with the sale of sulphate of ammonia; there appearing to be a clear *prima facie* case of a breach of the Statute.

There is trouble about a returned soldier at the Skipton Gas-Works; and one of the greatest of after-war problems is being sampled. A machine stoker, now over 50 years old, has been released from the army, after 2½ years' service, to substitute his own son at the gas-works. During his army work he has been receiving half-pay from the gas undertaking, and seems to have had the impression that he could return to exactly the same work that he left. The other workers on the job agree to his re-instatement as a stoker, but contend that it is unfair to expect them to relinquish work which they have carried on efficiently for so long, and threaten to strike if their wishes are not observed. Mr. J. H. Woodward (the Gas Manager) states that, though the man received half-pay, he had not been guaranteed re-instatement; but he (Mr. Woodward) had offered him work as a stoker at a higher rate of pay than he received before enlisting, and he declined it. It appears that he enlisted against the wishes of the Committee, and at a time when he was badly needed.

STOCK MARKET REPORT.

THE past week on the Stock Exchange has been a typical *ante*-Whitsun holiday week, intensified by the superadded calm of a Saturday closure. But though business, which started at something like half-pressure and gradually grew quieter and quieter until it fizzled out on Friday, made but a poor aggregate, yet the general tone of markets actually became firmer and firmer, and at length had a decidedly cheerful close. The character of the War news had no small part in influencing this course. Despatches from the British and French lines were wholly satisfactory, and none the less so for not being sensational; while the success of our Italian Allies was a great achievement. And with all this came the guarded revelations of more than one Minister that the submarine menace was steadily getting less formidable.

In no market was the cheering tendency more apparent than in Government issues. The War Loan became firmer day by day, and closed at its best. Consols shared in a lesser degree, and there was a good demand for Indian and Colonial issues. Home Rails caught the infection and gathered some strength. Americans held aloof by themselves. South Africans oscillated awhile, but closed firm. The Foreign Market exhibited great strength. French and Russian were in steady demand all along, and Japanese and Chilian were a good second. Among the Miscellaneous, Rubber was pretty firm; but there was some kicking, especially among the newer adventures, against the excess profits tax. Oils, Textiles, Armaments, and Shipping were firm.

Business in the Gas Market was on an extremely reduced scale. South Metropolitan had the lion's share of business, and even Gas Light ordinary could only muster eight bargains all told. However, the general tendency was in the upward direction, and nothing seemed to suffer from the neglect.

In the Money Market, rates at first ruled easy, but grew firmer as days went on. The value of the German mark on the Amsterdam Exchange fell last week to its lowest point since the outbreak of war.

Bargains done for cash during the week were as follows: On Monday, Alliance and Dublin 60, 60½, British 33 5/16, 33½, Continental Union preference 61, Gas Light ordinary, 73, 73¼, 73½, ditto preference 72¾, ditto debenture 57, Primitiva preference 60s., South Metropolitan 77½, 77¾, 78, 78½. On Tuesday, British 33⅜, 33½, 33⅝, Gas Light ordinary 73½, Imperial Continental debenture 64, South Metropolitan 77½, 77¾, 78, 78½, ditto debenture 57, 57½. On Wednesday, Brentford "A" 82, ditto "B" 80, Continental Union 40, Gas Light ordinary 73, ditto preference 72¾, ditto debenture 57½, Imperial Continental 80, ditto debenture 64½, Primitiva 42s. 3d., South Metropolitan, 77¾, 78¼, ditto debenture 57½, Walton and Weybridge "A" 14. On Thursday, Bombay 5, Commercial 4 p.ct. 72½, Gas Light ordinary 72, 73, 73¼, South Metropolitan 77¼, 77½. On Friday, Primitiva preference 60s., 61s. 3d., South Metropolitan 78¼.

The Bank rate is 5 p.ct., as fixed on April 5.

Owing to lack of coal, the Stuttgart Gas-Works have, says "The Times," shut off the supply of gas from 1 p.m. to 6.30 p.m., and from 8.30 p.m. to 5 a.m.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When last Dividend.	Previous Div or Dividend and Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p c.			..	57—63	..
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref. .	59—64	60—62	60—60½
1,551,868	,,	April 8	2½	5⅛%	Alliance & Dublin Ord.	76—79	58—63	..
874,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	5⅞—6⅜	5—5½	5
280,000	5	April 29	7½	4/6	Bombay, Ltd.	29—30	24—26	..
50,000	10	Feb. 26	16	15/-	Bournemouth Gas and Water { 10 p.c.	15—15½	10⅞—11¼	..
383,110	10	,,	7	7/-	B 7 p.c.	13½—14	9½—9¾	..
115,000	10	,,	6	6/-	Pref. 6 p.c.	..	71—73	..
159,740	—	,,	—	4%	4 p.c. Deb.	..	..	..
992,045	Stk.	Feb. 26	14	55/-	Brentford A Consolid. .	261—266	81—84	83
734 940	,,	,,	11	53/9	Do. B New . .	204—209	79—82	80
55,000	,,	,,	5	5%	Do. 5 p.c. Pref. .	109—111	83—88	..
221,400	,,	June 11	4	4%	Do. 4 p.c. Deb. .	91—93	67—69	..
217,380	,,	Feb. 26	11	10%	Brighton & Hove Orig. .	208—213	150—155	..
244,200	,,	,,	8	7%	Do. A Ord. Stk.	154—159	102—107	..
530 000	20	Mar. 26	12½	22/6	British	44—45	33—34	33 5/16—33⅜
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk..	88—90	66—68	..
215.771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	57—60	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	1⅜—2¼	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref. . .	4—6	5½—6	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	60—65	..
157.150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord. . .	108—110	79½—80½	..
1,513,280	,,	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk..	106—108	72—74	72½
563 000	,,	,,	5⅞	46/8	Do. 3½ p.c. do..	103—105	66—68	..
475,000	,,	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	52—54	..
800,000	,,	,,	4	—	Continental Union Ltd.	76—79	39—41	40
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	60—62	61
278,400	—	—	—	11½%	Croydon B and C 7 p.c..	..	170—180	..
—	—	—	—	10%	Do. E	..	..	..
492,270	Stk.	—	6	5⅜%	Derby Con. Stk. . . .	123—125	95—100	..
55 000	,,	—	4	4%	Do. Deb. Stk. .	102—104	80—83	..
1,032.180	10	July 29	10	7/6	European, Ltd. . . .	17½—18	12—13	..
16 313 430	Stk.	Feb. 10	4/17/4	42/-	Gas Light and Coke { 4 p.c. Ord. . .	98—102	72—74	72—73½
2,600 000	,,	,,	3½	3½%	3½ p.c. max. . .	76—79	56—58	..
4,062,235	,,	,,	4	4%	4 p.c. Con. Pref.	95—99	72—74	72⅞
4,674 850	,,	June 11	3	3%	3 p.c. Con. Deb.	72½—74½	56—58	57—57½
130,000	,,	,,	10	10%	10 p.c. Bonds .	..	..	..
2 8,740	,,	Mar. 12	5	4½%	Hastings & St. L. 3½ p.c.	87—89	50—55	..
70 000	10	April 29	11	6%	Hongkong & China, Ltd.	16¼—16½	8—9	..
86,600	—	—	—	9½%	Hornsey 7 p.c.. . . .	..	120—130	..
131,000	Stk.	Mar. 12	7½	7½%	Ilford A and C. . . .	151—154	102—107	..
65,780	,,	,,	6¾	5⅝%	Do. B	115—118	80—85	..
65.500	,,	June 26	4	4%	Do. 4 p.c. Deb . . .	92—94	68—71	..
4,940,000	,,	May 14	9	4½%	Imperial Continental .	150—160	79—84	80
1,235,000	,,	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	62—65	61—64½
235,242	,,	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c. .	119—121	85—90	..
2,498,905	,,	Feb. 26	10	5%	Liverpool 5 p.c. Ord. { A / B	211—213 / 146—148	82—84	..
306,083	,,	June 26	4	4%	Do, 4 p.c. Pr. Deb. Stk.	..	72—74	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4⅛—4⅝	3⅞—4⅛	..
250,000	100	April 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	88—98	..
541,920	20	May 28	4	6/-	Monte Video, Ltd. . .	11½—12	8¾—8½	..
1,875,892	Stk.	July 29	4½	4½%	Newcastle&Gatsh'dCon.	98½—99½	69¾—70½	..
529,705	,,	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—83	73—75	..
55,940	10	Feb. 26	7/14/0	7%	North Middlesex 7 p.c. .	14—15	10—11	..
300,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	104—106*	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7¼—7¾	2—3	..
60.000	50	Feb. 26	13	12%	Portsea, Island B . . .	128—131	92—97	..
100,000	50	,,	12	11%	Do. C . . .	118—121	85—90	..
52,000	50	,,	10	9%	Do. D . . .	..	..	..
249,980	5	April 29	8	—	Primitiva Ord. . . .	5½—6	2—2½	42/3
499,960	5	June 26	5	2/6	Do. 5 p.c. Pref. .	4½—5	3—3½	£0/—61/3
521,600	100	June 2	4	4%	Do. 4 p.c. Deb. .	91—93	78—80	..
—	—	—	—	4%	Do. ,, ,, 1911	..	..	..
346,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb. .	85—87	61—67	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref..	10½—11	7⅜—8½	..
125,000	50	July 1	5	5%	5 p.c. Deb..	47—49	42—44	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	223—224	175—180	..
209,984	,,	,,	10	10%	Do. B	223—224	175—180	..
523 500	,,	,,	10	10%	Do. C	220—222	175—180	..
90,000	10	May 28	9	6/-	South African. . . .	10½—11½	..	..
6,609,895	Stk.	Feb. 10	5/4/0	46/8	South Met. 4 p.c. Ord. .	111—113	77—79	77½—78½
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb. .	72½—74½	56—58	57—57½
224,820	,,	Feb. 26	8½	8%	South Shields Con. Stk.	157—159	140—142	..
952,795	,,	,,	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	74—78	..
60,000	,,	,,	5	5%	Do. 5 p.c. Pref. . .	110—112	77—79	..
185,000	—	—	—	48/4	Do. West Kent . .	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	88—90	..
647,740	,,	May 14	5	5%	Southampton Ord. . .	99—102	76—78*	..
120,000	,,	Feb. 12	7½	7½%	Tottenham District { A 5 p.c. .	135—138	93—100	..
782,275	,,	,,	6	5⅝%	B 3½ p.c. .	115—117	68—73	..
181.255	,,	June 26	4	4%	4 p.c. Deb.	87—89	65—67	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max..	103½—109½	89—91	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Feb. 26	8⅔	80/-	Wandsworth A 5 p.c..	151—156	114—119	..
255 636	,,	,,	6½	65/-	Do. B 3½ p.c. .	129—134	99—101	..
108,075	,,	,,	5/17/3	56/-	Do. C 3½ p.c. .	110—115	86—91	..
352,000	,,	,,	6½	58/9	Wimbledon 5 p.c. . .	117—122	88—93	..
98,000	,,	,,	6⅔	65/-	Epsom 5 p.c. . . .	121—126	96—101	..
88,416	,,	June 26	3	3%	3 p.c. Deb. Stk. . .	66—69	51—54	..

* Ex. Div.

On behalf of the Broxburn Oil Company, Ltd., Mr. W. B. Leech (the Engineer and General Manager of the Leeds Corporation Gas Department) draws attention to a paragraph which appeared in the "Journal" of the 8th inst. (p. 253), in which it was stated that a tender had been accepted by the Leeds Corporation for 200 tons of gas oil at the price of 10·07d. per gallon. This price, he points out, is incorrect; the figure should be 11·07d. per gallon.

There was a very satisfactory response to the offer made by Messrs. A. & W. Richards, for the Directors of the Croydon Gas Company, of £10,000 of 5 p.ct. redeemable mortgages. Tenders were received for £22,000, at prices ranging from £98 down to £96—the minimum. The lowest tender accepted was at £96 5s.; the average price obtained being £96 9s. 9d., which gives a yield (allowing for redemption at par in six years) of £5 14s. 3d. p.ct.

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Sulphate of Ammonia Plant. Newton-in-Makerfield Gas-Works.

TENDERS FOR

Coal.

Hebden Bridge and Mytholmroyd Gas Board. Tenders by June 12.

Limerick Gas Committee. Tenders by June 4.
Oswaldtwistle District Council. Tenders by May 31.
Stretford Gas Company. Tenders by June 12.

Tar and Liquor.

Loughborough Gas Department. Tenders by June 11.
Northwich Gas Company. Tenders by June 9.

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